AAU/DR/14(BU)/73/2014-15-1

INDIGENOUS TECHNICAL KNOWLEDGE

All India Coordinated Research Project for Dryland Agriculture
Biswanath Chariali Centre
Biswanath College of Agriculture, AAU
Biswanath Chariali - 784176, Sonitpur, Assam

T- PERCH ... ROOSTING SITE FOR PREDATORY BIRDS IN RICE FIELD - AN IMPROVISED TRADITIONAL KNOWLEDGE OF FARMERS' DEVICE FOR INSECT PEST MANAGEMENT *(PHOTO COURTESY: DR. PRABAL SAIKIA)*

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Dr. G. N. Hazarika
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FOREWORD

I am happy to learn that All India Coordinated Research Project on Dryland Agriculture, B. N. College of Agriculture, Assam Agricultural University, Biswanath Chariali is going to publish a book entitled Indigenous Technical Knowledge (ITK). ITKs are age old practice evolved by farmers through their practical experience gained over generations and ages. Though not backed by sound scientific explanation, many of such traditional practices are well suited, proven and environmental friendly. Systemic study and validation of such hear say information is very much needed which will enrich and supplement our existing scientific practice. During passage of time and to some extent because of our negligence, much such valuable information has already been lost. I congratulate the Chief Scientist, AICRPDA, BNCA and his team of scientists and technical staff for their sincere efforts towards collecting, compiling such valuable information and ultimately publishing these in a form of a book.

I am sure this book will attract attention of all section of people.

Place : Jorhat
Dated: 25-11-1014

(G.N. Hazarika)

have become obsolete when faced with the wide range of scientific knowledge and it fast-paced development have Furthermore, formal education systems have disrupted the practical everyday life aspects of indigenous knowledge and ways of learning, replacing them with abstract knowledge and academic ways of learning thereby resulting in the loss of much indigenous and, along with it, valuable knowledge about ways of living and maintaining food, nutrition and environment sustainably.

It gives me immense pleasure to learn that All India Coordinated Research Project on Dryland Agriculture (AICRPDA), Biswanath College of Agriculture in Biswanath Charialiis going to publish a book on "Indegenous Technical Knowledge". I congratulate the Chief Scientist, AICRPDA, and his team for such a valuable effort.

I am sure this book will serve the future generation as a comprehensive document even if many of the ITKs become extinct.

(H.C. Bhattacharyya)
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Preface

In spite of rapid advancement in scientific knowledge in agriculture, ITK based practices are still being used by majority of the farming community, particularly in resource poor farming situations. In this context, blending of indigenous knowledge with modern scientific technologies is the need of the day to support sustainable development of agriculture and allied sectors in our country.

Agricultural research for the most part has been highly discipline-oriented in our country. Normal science generates packages, whereas resource-poor families engaged in farming, find it difficult to adopt the new technologies due to inadequate scientific knowledge as well as lack of adequate financial resources. Improved agricultural technologies focuses primarily on attaining high yield of target crops. The introduction of modern technologies *viz*. application of chemical fertilizers, agrochemicals, machinery, and modern methods of irrigation in developing countries resulted in departure from traditional agriculture and non-judicious use of new technologies may lead to environmental pollution and land degradation. In addition, lack of relevance to small farm situations has been found to be one of several constraints in the adoption of modern technologies by farmers. During the process of technology development, farmers' traditional knowledge is usually not considered. On-farm trials conducted by researchers and extension workers mostly concentrate on crop varietal comparison, fertilizer response, and testing of different packages of practices for different crops. While developing farmers friendly modern technologies, there is a need to incorporate, farmers experiences on alternative coping strategies to avoid extreme conditions such as droughts and floods, diversified food production techniques such as intercropping and border cropping in order to broaden their food and fodder requirements, and adjusting their sowing and harvesting periods to meet the local market demand.

Indian agriculture is at present confronted with a number of challenges including instability of productivity and diminishing sustainability of natural resources. These issues have evoked growing interest in the study of the indigenous knowledge systems that are based upon the local resources. Since, information on ITK is seldom documented, it often happens that such information are lost, if not passed on from generation to generation or protected and practiced by the local people. Our effort for documentation of ITK is for the benefit of researchers, planners, development officials and farmers. Suitable modifications of the local practices, through research and development will help to develop appropriate and acceptable technologies that are more suited to our farming situations.

This book has been written in a very simple and easily understandable language. It is believed that this book will serve the scientific society in a variety of ways. Undergraduate and postgraduate students, professors, teachers, scientists, researchers and farmers having interests in different field of specialization will certainly be benefited.

We acknowledge the help and suggestions received from Dr. Ch. Srinivasa Rao, Director, CRIDA, Dr. G. N. Hazarika, DR(Agri), AAU, Jorhat, Dr. H. C. Bhattacharyya, DEE, AAU, Jorhat, all the authors and faculty member of BN College of Agriculture, AAU, B Chariali.

The assistance rendered by Mr. Chakradhar Goswami, President, NICRA village climate risk management committee, Chamua, Lakhimpur, is acknowledge.

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পৰম্পৰাগত কৃষি, বতৰ পৰিৱৰ্ত্তন আৰু NICRA প্ৰকল্প

Chakradhar Goswami
President,
NICRA village Climate Risk
Management Committee,
Chamua, Lakhimpur-784164,
Assam, India

আমি অনুভৱ কৰিব পাৰিছো যে, আজি কিছু বছৰৰ পৰা বতৰৰ পৰিৱৰ্তনে আমাৰ কৃষি ক্ষেত্ৰত বাৰুকৈয়ে প্ৰভাৱ পেলাইছে। বতৰৰ পৰিৱৰ্তনৰ লগে লগে শালি খেতি ২০/২৫ দিন আগুৱাই আহিল আৰু কৃষকে আহুখেতি কৰিবলৈ বাদ দিলে। ইয়াৰ কাৰণ হ'ল -

১) আহুখেতি কৰাৰ সময়ত কোনো বছৰত বৰ ইমান বেছি খৰাং হয়, ধান গজি উঠাত পলম হয় আৰু অপতৃণ বিলাক বৃদ্ধি হয়।

২) কোনো বছৰত ধান বিন্ধা মৈ দি নিৰণি কৰা সময়ত বৰষুণৰ মাত্ৰা বেছি হোৱাত ধান নিৰণি কৰা সময় সাৰি যায়, ফলত ধানতকৈ অপতৃণ বৃদ্ধি হৈ ধানে ঘাঁহে সমান হয়।

৩) কোনো বছৰত আহুধান কটা সময়ত প্ৰবল বৰষুণৰ ফলত বানপানী সদৃশ ঢল আহি ২/৩ দিন বুৰাই ৰাখি আহুধান নষ্ট কৰে। কেতিয়াবা পানী কমাৰ লগে লগে খৰাং পৰিস্থিতিৰ সৃষ্টি হয় ফলত আহুতলি মাটিত শালি খেতি কৰিব পৰা নহয়।

৪) শালিধান চপোৱাৰ পিছত গৰু বিলাক সকলো গাৱৰ মানুহে উদং দিয়ে ফল স্বৰূপে ফাগুণ, চ'ত আৰু ব'হাগ এই তিনিমাহ গৰুৰ কাৰণে খেতি ৰাখিব নোৱাৰি। এনেবোৰ কাৰণতে আমাৰ অঞ্চলত আহুখেতি লোপ পালে। কোনো কোনো বছৰত বৰষুণ কম হোৱা বাবে বাম চানেকীয়া মাটি ৰুৱলৈ থাকি যায় আৰু মধ্যমীয়া মাটিতো খেতি ভাল নহয়। গত ২০০১, ২০০৫, ২০০৬, আৰু

২০০৯ চনত বতৰৰ পৰিবৰ্তনৰ ফলত কম বৰষুণ হোৱা বাবে খেতিয়কৰ মাজত হাহাকাৰ সৃষ্টি হয়। বহুতৰে মাটি ৰুৱলৈ থাকি গ'ল আৰু ৰোৱা খিনিৰ ভাল ফল পোৱা নগ'ল।

আমাৰ গাঁওখনত বিভিন্ন প্ৰকাৰ মাটি আছে। বৰী মাটি, বাম চানেকীয়া মাটি, মধ্যমীয়া মাটি আৰু দ মাটি। বৰী এলেকাটো প্ৰায় ১৫০ বিঘামান মাটি আছে। এই মাটি খিনি গো চৰণীয়া পথাৰ হিচাপে ব্যৱহাৰ কৰি অহা হৈছিল। পুৰণিকলীয়া কৃষি প্ৰণালীকে খামোচা মাৰি ধৰি থকা, আমাৰ কৃষক সকলক বিভিন্ন সমস্যাই জুৰুলা কৰা সময়তে আমাৰ গাঁৱত NICRA প্ৰকল্প উপস্থিত হলহি। ২০০৯ চনৰ জুলাই মাহৰৰ শেষ সপ্তাহত বিশ্বনাথ কৃষি মহাবিদ্যালয়ৰৰ সমন্বিত শুষ্ক ভূমি কৃষি গৱেষণা আঁচনিৰ মুখ্য বিজ্ঞানী ড° হেম বৰুৱা সহ কেইবাগৰাকী কৃষি বিজ্ঞানী আমাৰ গাঁওখনলৈ আহি উপস্থিত কৃষকৰ পৰা কিছু তথ্য আহৰণ কৰিছিল। ২০১০ চনৰ জানুৱাৰী মাহত বিজ্ঞানী সকলে কৃষকৰ পথাৰ সমূহ পৰিদৰ্শন কৰি কৃষক বন্ধু সকলৰ লগত মত বিনিময় কৰে। সেই বছৰৰে ফেব্ৰুৱাৰী মাহত গাঁৱৰ কৃষক সকলক সমবেত কৰাই NICRA ৰ উদ্দেশ্য সমূহ আৰু ইয়াৰ কাৰ্য্যকাৰিতাৰ পদ্ধতি সমূহ বুজাই কোৱাত স্থানীয় ৰাইজে বতৰৰ পৰিবৰ্তনে কৰা ক্ষতি সমূহ পুৰণ কৰাৰ আঁচনি সমূহত অংশ গ্ৰহণ কৰিবলৈ আগহ প্ৰকাশ কৰে। এইখিনিতে আঁচনি খনৰ বিষয়ে উল্লেখ কৰা হ'ল - NICRA মানে National Initiative on Climate Resilient Agriculture । ই এটা ৰাষ্ট্ৰীয় প্ৰকল্প। জলবায়ু পৰিবৰ্তনৰ কু প্ৰভাৱৰ পৰা আমাৰ দেশৰ কৃষি খণ্ডক ৰক্ষা কৰাৰ উদ্দেশ্যে ২০০৯ চনত ভাৰত চৰকাৰে ভাৰতীয় কৃষি গবেষণা পৰিষদ আৰু ৰাজ্যিক কৃষি বিশ্ববিদ্যালয় সমূহৰ সহযোগত NICRA প্ৰকল্পৰ কাম আৰম্ভ কৰে।এই প্ৰকল্পৰ জৰিয়তে বানপানী, খৰাং আদি বতৰৰ কুপ্ৰভাৱৰ পৰা আমাৰ দেশৰ কৃষক সকলক উদ্ধাৰ কৰাৰ বিশেষ ব্যৱস্থা হাতত লোৱা হৈছে। প্ৰাকৃতিক দুৰ্য্যোগৰৰ সংখ্যা বাঢ়িলেও যাতে কৃষি উৎপাদন হ্ৰাস নহয় বৰং বৃদ্ধিহে হয় তাৰ প্ৰচেষ্টাত কৃষি বিজ্ঞানী সকল ব্ৰতী হৈছে। এই প্ৰকল্পৰ জৰিয়তে আমাৰ দেশৰ বিভিন্ন অঞ্চলত কৃষক সকলৰ মাজত জলবায়ু পৰিৱৰ্তনৰোধী কৃষি ব্যৱস্থাৰ পৰিকল্পনা তথা প্ৰয়োগ, উন্নত মানদণ্ডৰ কৃষি প্ৰযুক্তি প্ৰদৰ্শনৰ দিহা কৰা হৈছে। NICRA প্ৰকল্পত চাৰিটা বিষয়ৰ ওপৰত গুৰুত্ব দিয়া হৈছে। সেয়া হৈছে জলবায়ু পৰিৱৰ্তনৰোধী কৃষি ব্যৱস্থাৰ পৰিকল্পনা তথা প্ৰয়োগ (Real time contingency Plan implementation), বৰষুণৰ পানী সংৰক্ষণ আৰু ব্যৱহাৰ (Rain water

harvesting and use), কৃষিখণ্ডত শক্তিৰ সু-ব্যৱহাৰ (Efficient energy use and management) আৰু সমন্বিত কৃষি আৰু কৃষি ভূমিৰ সু-ব্যৱহাৰ (Alternate land use farming system for carbon sequestration and ecosystem services)।

NICRA প্ৰকল্পৰ জৰিয়তে গাঁওখনত সজগতা সভা, মাটি পৰীক্ষা, গোধন ৰক্ষাৰ কাৰণে মহামাৰী প্ৰতিষেধক বেজি দিয়া, গো ৰক্ষাৰ বাবে ঘাঁহ উৎপাদন, আদা, হালধী আৰু ৰহৰ মাহৰ খেতি প্ৰথম আৰম্ভ কৰা হ'ল। অসম কৃষি বিশ্ববিদ্যালয়ৰ আগশাৰীৰ পাৰদৰ্শী ব্যক্তি সকলৰ দ্বাৰা কৃষক সকলক প্ৰশিক্ষণ দিয়া হৈছে। উত্তৰ পূব ফাৰ্ম মেচিনাৰী পৰীক্ষণ আৰু প্ৰশিক্ষণ প্ৰতিষ্ঠানৰ বিশেষজ্ঞ সকলে অংশ গ্ৰহণ কৰি কৃষি যান্ত্ৰীকিকৰণ সম্পৰ্কত সজগতা আনে। NICRA প্ৰকল্পৰ জৰিয়তে আমাৰ গাঁওত হ্ৰস্ব, মধ্য আৰু দীৰ্ঘ ম্যাদৰ আধিক উৎপাদনক্ষম বিভিন্ন জাতৰ ধান খেতি কৰি এই জাতবোৰৰ উপযুক্ততা সম্পৰ্কে কৃষক সকলক সজাগ কৰা হৈছে। লুইত, কপিলি, লাচিত, দিহাংগী, মালা আদিৰ দৰে ১২০ দিনতে চপাব পৰা খেতি কৰা হৈছে। শালিধান কৰা সময়ত মধ্যকালিন বা শেহতীয়া ভাবে হোৱা শুষ্ক পৰ্ব সমূহৰ কবলৰ পৰা এনে জাতবোৰ সাৰি থাকে। ২০১২চনৰ আগষ্ট মাহৰ পৰা বৰষুণ কমি যোৱাৰ বাবে শালিধান কেইবাটাও শুষ্ক পৰ্বৰৰ মুখামুখি হয়। ফলত দীৰ্ঘম্যাদী আৰু থলুৱা ধানৰ জাতবোৰৰ উৎপাদন বহু পৰিমানে হ্ৰাস পায় যদিও হ্ৰস্য শস্যকালীন জাতবোৰ চেপ্তেম্বৰ মাহৰ প্ৰথম সপ্তাহতে চপাব পৰা হোৱা বাবে শুষ্ক পূৰ্বৰ কু-প্ৰভাৱৰ পৰা মুক্ত হৈ থাকে। লুইত, লাচিত, কপিলি, দিচাং হ্ৰস্বম্যাদী জাতবোৰৰ বানপানীৰ আগতে চপাব পৰাকৈ নাইবা বানপানীৰ পাছত শেহতীয়া শালি হিচাপেও কৰিব পাৰি। বানপানী বা খৰাং আদিৰ দৰে উদ্ভৱ হব পৰা প্ৰতিকূল পৰিস্থিতি মোকাবিলা কৰিবলৈ আমাৰ গাঁৱত হ্ৰস্বম্যাদী ধানৰ এটা বীজ ভাণ্ডাৰ গঢ়ি তোলা হৈছে। এনদেৰে বীজ ভাণ্ডাৰ গঢ়ি তোলাটো বতৰৰ চৰম ঘটনা সমূহৰ কু প্ৰভাৱ লাঘৱ কৰণৰ এটা কৌশল।

যোৱা বছৰ সমূহত আমাৰ গাঁৱত মধ্যম্যাদী ধানৰ বিভিন্ন জাত যেনে - সত্যৰঞ্জন, বসুন্ধৰা, গান্ধাৰী, মোহন, মুলাগাভৰু আদিৰ উপযুক্ততা প্ৰদৰ্শন কৰা হৈছে। এই জাতবোৰৰ খেতি চপোৱাৰ পিছত মাটিডৰা সৰিয়হ, আলু আদি ৰবি শস্যৰ খেতিৰ বাবে খালিহৈ পৰে। ছুটি আৰু মধ্যম্যাদী জাতবোৰ একেডৰা মাটিতে বছেৰেকত কমেও দুটা খেতি কৰিবৰ বাবে উপযোগী। গাঁওখনৰ দ মাটি খিনিত য'ত খৰাং সদৃশ পৰিস্থিতিৰ উদ্ভৱ হলেও পানীৰ অভাৱ নহয় তেনে মাটিবোৰত দীৰ্ঘম্যাদী জাতবোৰ উপযোগী বুলি প্ৰমাণিত হৈছে। এনে জাতবোৰৰ উৎপাদন প্ৰতি বিঘাই ২৩/২৪ মোন

পর্য্যন্ত হয়। গাঁও খনত দীর্ঘ ম্যাদী বিভিন্ন জাতৰ ধান যেনে - ৰঞ্জিত, বাহাদুৰ, মনিৰাম, কুশল, মাচু ৰী, কেতেকী জহা আদি খেতি কৰা হয়। তদুপৰি বানাক্রান্ত অঞ্চলৰ বাবে জলশ্রী, জলকুঁৱৰী, প্রফুল্ল, স্বর্ণচাব ধানৰো খেতি কৰা হৈছে। আমাৰ ইয়াত বিভিন্ন পৰিস্থিতিৰ বাবে উপযোগী ধানৰ বিভিন্ন গুণ সম্পন্ন বিভিন্ন জাতৰ খেতিৰ প্রদর্শন কৰা হৈছে। সেয়েহে কৃষক সকলে ইচ্ছানুযায়ী তেওঁলোকৰ বাবে উপযোগী ধানৰ জাত সমূহ নিজে নির্বাচন কৰি ল'ব পাৰে।

বৈচিত্র পূর্ণ কৃষি পদ্ধতি জলবায়ু পৰিৱর্ত্তন ৰোধী আৰু ইয়াৰ পোষকতা কৰা উচিত। সেয়েহে NICRA প্রকল্পৰ জৰিয়তে যোৱা বছৰ সমূহত আমাৰ গাঁওত ভিন্ন প্রকাৰৰ শস্যৰ প্রৱর্তন তথা খেতি কৰা হৈছে। তাৰ ভিতৰত উন্নত জাতৰ মাকৈ, হালধি, আদা, আলু, কচু, ৰহৰ, মাটিমাহ, মগুমাহ, মটৰমাহ, তিল, সৰিয়হ, ওলকচু, গৰুৰ কাৰণে নেপিয়েৰ আৰু ওট কেতি কৰা হৈছে।

আগতে উল্লেখ কৰা হৈছে আমাৰ গাঁওত ১৫০ বিঘামান বৰী (টিকা) মাটি আছে। কোনো কালে খেতি কৰা হোৱা নাছিল। পানীৰ অভাৱত খেতি কৰিব নোৱাৰি গো চৰণীয়া পথাৰ হিচাবে ব্যৱহাৰ কৰিছিল। NICRA ৰ যোগেদি ইয়াত থকা তিনিটা প্রাকৃতিক ভাবে সৃষ্টি জলাশয় নবীকৰণ কৰি পানী সংৰক্ষণৰ ব্যৱস্থা কৰা হৈছে। এই সংৰক্ষিত পানী ব্যৱহাৰ কৰি চন পৰি থকা বৰী এলেকাটো শস্য পথাৰলৈ ৰূপান্তৰিত কৰা হৈছে। NICRA প্রকল্পৰ জৰিয়তে গাঁও খনৰ পথাৰৰ মাজত থকা ১৩ টা পুখুৰীও নবীকৰণ কৰা হৈছে। আমাৰ কৃষক সকলে আগতে কেতিয়াও পুখুৰীৰ গুৰুত্ব উপলব্ধি কৰা নাছিল যদিও তেওঁলোকে এতিয়া পানী সংৰক্ষণৰ গুৰুত্ব বুজিব পাৰিছে। এইটো NICRA ৰ এটা ডাঙৰ কৃতকার্য্যতা। NICRA প্রকল্পৰ এক প্রধান অৱদান হৈছে আমাৰ গাঁওত স্থাপন কৰা Custom hiring Centre টো। কোনো কালে যন্ত্রপাতি ব্যৱহাৰ নকৰা গাঁওখনত এনে এটা কেন্দ্র স্থাপন কৰাৰ ফল স্বৰূপে গাঁওখনটো এক বৈপ্লবিক পৰিৱর্তনৰ সূচনা হৈছে। কেন্দ্রটোত মৰণা মৰা যন্ত্র, প্রেয়াৰ মেচিন, পানী দিয়া মেচিন, ৰোটাভেটৰ, কাল্টিভেটৰ, ডিষ্কপ্লাও, ৰিদ্‌জাৰ, নিৰণিযন্ত্র, sprinkler irrigation বাবে প্রয়োজনীয় আচবাব, গুটি আৰু সাৰ সিঁচা মেচিন, পাৰাৰ টিলা, ধান কটা মেচিন, এনৰি প্লাও, ধানৰোৱা মেচিন আদিও আছে। আমাৰ অঞ্চলটোত খেতি কৰা বাবে প্রয়োজনীয় শ্রমিকৰ অভাৱ হৈ আহিছে। এনে পৰিস্থিতিত কেন্দ্রটো স্থাপন কৰাত শ্রমিকৰ অভাৱ দূৰ হোৱাৰ উপৰিও বছৰটোত অতি কমেও দুটা খেতি কৰিব পৰা পৰিৱেশ সৃষ্টি হৈছে। NICRA প্রকল্পৰ জৰিয়েত

গাঁওখনৰ ৬ জন যুৱকক বিশ্বনাথ চাৰিআলিত অৱস্থিত ফার্ম মেচিনাৰী প্রশিক্ষণ কেন্দ্রত যন্ত্রপাতি চলোৱা আৰু মেৰামতি কৰাৰ প্রশিক্ষণ দি অনা হৈছে। তেওঁলোকে মেচিনবোৰ চলোৱাৰ উপৰিও মেৰামতি কৰে। খেতিয়ক সকলে কৃষি সজুলি কেন্দ্রটোৰ পৰা ভাড়ালৈ লয়। ভাড়াৰ বাবদ সংগ্রহ হোৱা পুঁজিৰ এটা অংশ মেচিন চলোৱা চালক জনক দিয়া হয় আৰু বাকী অংশ সমিতিৰ পুঁজিলৈ ৰয়।

NICRA প্রকল্পৰ জৰিয়তে গাঁওখনত পূর্বৰে পৰা চলি থকা সমন্বিত কৃষি ব্যৱস্থা সবলীকৰণৰ কামো হাতত লোৱা হৈছে।

১। সমন্বিত হাঁহ আৰু মাছ পালন

২। সমন্বিত গাহৰি আৰু মাছ পালন

৩। তিনিতৰপীয়া হাঁহ, গাহৰি আৰু মাছ পালন।

উন্নত জাতৰ গাহৰি যোগান ধৰা হৈছে কিয়নো এনে জাতৰ গাহৰিৰ বৃদ্ধিৰ হাৰ অধিক। প্রকল্পৰ জৰিয়তে হাঁহ আৰু গাহৰি গৰাল পুখুৰীৰ পাৰত স্থায়ী ভাবে নিমার্ণ কৰি দিয়া হৈছে। সেয়েহে কৃষক সকলক বিভিন্ন শস্যৰ সমন্বিত কৃষি ব্যৱস্থা গ্রহণ কৰিবলৈ উদগনি যোগোৱা হৈছে। কৃষক সকলৰ মাজত জৈৱিক সাৰৰ ব্যৱহাৰ কৰাৰ উদ্দেশ্যে তেওঁলোকক প্রশিক্ষিত কৰি তোলাৰ উপৰিও গাঁওখনত কেইবাটাও কেচু সাৰ উৎপাদন কৰা গোট সাজি উলিওৱা হৈছে। বর্তমান NICRA প্রকল্পৰ কাম পঞ্চায়ত খনৰ বিভিন্ন গাঁৱলৈ প্রসাৰ হৈছে। কৃষক সকলৰ বিপুল সহাৰি পোৱা হৈছে। NICRA ৰ লগতে ৰাজ্যিক কৃষি বিভাগ, পঞ্চায়ত আৰু গ্রামোদ্যোগ বিভাগ, পশু চিকিৎসা বিভাগ আদিয়ে কৃষক সকলক বিভিন্ন ধৰণে সহায় সহযোগ আগবঢ়াই আহিছে। যোৱা বছৰ কেইটাত ১০ টাৰো অধিক কৃষি বিষয়ৰ প্রশিক্ষণ অনুষ্ঠিত কৰা হয়। ২০১৪ চনত ২৮ জন কৃষকে ফার্ম মেচিনেৰী প্রশিক্ষণ গ্রহণ কৰিছে। তদুপৰি বিভিন্ন আগশাৰীৰ কৃষিৰ লগত জড়িত অনুষ্ঠান বা প্রগতিশীল কৃষকৰ পামলৈ ফুৰাবলৈ লৈ যোৱাৰ ব্যৱস্থা কৰা হৈছে।

গাঁৱৰ কৃষক ৰাইজৰ কল্যানার্থে নিয়মীত ভাৱে বতৰৰ আগলি বতৰা আৰু বতৰ ভিত্তিক কৃষি পৰামর্শৰালী ফলকত লিখি থোৱা হয়। এই পৰামর্শৰালী বিশ্বনাথ কৃষি মহাবিদ্যালয়ত অৱস্থিত বতৰ ভিত্তিক কৃষি পৰামর্শাৱলী কেন্দ্রই নিয়মিয়াকৈ যোগান ধৰি আহিছে।

মাটিৰ উৎপাদিকা হ্রাস, কৃষি যন্ত্রপাতি ব্যৱহাৰ নকৰা, কেৱল মাত্র শালিধানৰ খেতি কৰা, আধুনিক কৃষি বিজ্ঞান সম্পর্কীয় জ্ঞানৰ অভাৱ আদি এশ এবুৰি সমস্যাৰে জর্জ্জৰিত গাঁওখনলৈ NICRA প্রকল্পই চকুত লগা পৰিৱর্তন আনিবলৈ সক্ষম হৈছে। গাঁওখনলৈ ভাৰতৰ বিভিন্ন ঠাইৰ প্রখ্যাত কৃষি বিজ্ঞানী সকলৰ আগমন ঘটিছে, কৃষক মেলা পতা হৈছে। তুলনামূলক ভাবে আমাৰ ইয়াৰ খেতিয়ক সকলৰ কৃষি বিজ্ঞান সম্পর্কীয় জ্ঞানৰ স্তৰ বহুপৰিমাণে উর্দ্ধগামী হৈছে।

অসম কৃষি বিশ্ববিদ্যালয় বিশ্বনাথ কৃষি মহাবিদ্যালয়ৰ বিজ্ঞানী সকলৰ সহায় সহযোগিতা অবিহনে আমি আজিএই অৱস্থা পোৱাটো কেতিয়াও সম্ভৱ নহলহেতেন। আমাক বাট দেখুৱাই আগবঢ়াই নিবলৈ NICRA প্রকল্প আৰু বিজ্ঞানী সকল সদায়েই আমাৰ মাজত থাকিব। আমাৰ গাঁওখনৰ লগতে অঞ্চলটোৰ, ৰাজ্যখনৰ কৃষি উন্নয়নত সহযোগ কৰিবলৈ কৃষক বন্ধু সকল সংকল্পবদ্ধ।

অসমৰ জলবায়ু গৰম আৰু সেমেকা হোৱা বাবে কৃষি উপযোগী। সেয়েহে অসম এখন কৃষি প্রধান ৰাজ্য। অসমৰ বিভিন্ন অঞ্চলৰ পৰিৱেশ, মাটিৰ গুণাগুণ, উর্ব্বৰা শক্তি ভিন ভিন হোৱা বাবে কৃষকৰ খেতি কৰা ব্যৱস্থাতে পৃথক হোৱা দেখা যায়। পৃথিৱীৰ বৃহত্তম নদীদ্বীপ মাজুলীৰ শেষ প্রান্তত থকা আঁহতগুৰি মৌজাৰ এজন সাধাৰণ খেতিয়ক হিচাপে লাভ কৰা অভিজ্ঞতা বর্ণনা কৰিবলৈ প্রয়াস কৰিছো। আঁহতগুৰি মৌজাৰ দক্ষিণ দিশত ব্রহ্মপুত্র আৰু উত্তৰ দিশত সোৱনশিৰি নদী। কোনো মাথাউৰিৰ ব্যৱস্থা নাছিল। প্রতি বছৰ দক্ষিণ পশ্চিম মৌচুমী বায়ুৰ প্রভাৱত হোৱা প্রৱল বৰষুণৰ ফলত ব্রহ্মপুত্র আৰু সোৱনশিৰি নদী ফেনে ফোটোকাৰে বাঢ়ি আহি অঞ্চল সমূহ বানপানীৰ ফলত পশুধনকে আদি কৰি শস্যৰ বিস্তৰ ক্ষতি কৰে। এই অঞ্চলত ধান খেতিৰ ভিতৰত প্রধানকৈ আহু আৰু বাও ধানৰ খেতিৰ ওপৰতে অধিক গুৰুত্ব দিয়া হৈছিল। আহাৰ মাহৰ দ্বিতীয় সপ্তাহৰ পৰা বানপানী আৰম্ভ। সেয়েহে শালিধানৰ ওপৰত গুৰুত্ব কম। সহজে পানী হোৱা দ মাটিত পুহ মাহৰ শেষ সপ্তাহৰ পৰা ক্রমান্বয়ে মাটিৰ ফচ্চতাৰ ওপৰত নির্ভৰ কৰি চ'ত মাহৰ মাজভাগলৈকে আহুধানৰ কঠিয়া সিঁচা হয়।

ডাকে কৈছে -

'পুহত আহু জেঠত শালি
তেবেসে জানিবা গৃহস্থালী।'

আহু সিঁচা মাটি ডৰা কেইবাবাৰো হালবাই মৈ দি চপৰাবোৰ ভাঙি মিহি কৰি লব লাগে। আৱশ্যক মতে দলিমাৰীৰে চপৰাবোৰ ভাঙি দিব লাগে। হালবাওতে ওলোৱা জাৱৰ জোথৰ বোৰ শুকাই পুৰি পেলাব লাগে নতুবা আতৰাই লব লাগে। মাটি ডৰা ভালদৰে চাহ হোৱাৰ পাছত বিঘাই প্ৰতি ১০-১২ কিলোগ্ৰাম বীজ সিঁচিব লাগে। বীজ সিঁচাৰ পাছত হালবাই মৈ দিব লাগে। আহু সিঁচা ২-৩ দিনৰ পাছত মাটি ডৰা পুনৰ হালবাই মৈ দিব লাগে। ইয়াকে উভলা বুলি কোৱা হয়। ইয়াৰ দ্বাৰা ওপৰতে থকা ধানৰ বীজ তললৈ যায় আৰু একেবাৰে তলত পৰা বীজ বিলাকো ওপৰলৈ আহে। সমানে বীজৰ গজালি মেলে।

আহুধানৰ জাতবোৰ এনে ধৰণৰ ঈশজাই, লতাগুনী, কলা-ডোঙোৱা, বগা আহু আদি। কোনো খেতিয়কে আহুৰ লগতে বাও ধানো দ অঞ্চল সমূহত সিঁচি দিয়ে। আগতিয়াকৈ বানপানী আহিলে আহুধান নষ্ট হলেও বাওধানৰ ক্ষতি নহয়। আহু আৰু বাও একেলগে সিঁচিলে আহুৰ উৎপাদন কিছু কম হয়।

আহুধানৰ প্ৰধান সমস্যা হ'ল বন-বাত। সেই কাৰণে আহুধান গজাৰ ২০-২৫ দিনৰ ভিতৰত বিন্ধাই দিব লাগে। বিন্দাই দিয়াৰ ফলত ডাঠ ধান বিলাক পাতল হ'ব আৰু পুলি বোৰৰ গুৰিত মাটি পৰি গছবোৰ সৱল হব। নিৰণি কৰিবলৈ সহজ হয়। বন-বাত নিৰনি কৰিব নোৱাৰিলে আহুধানৰ উৎপাদন আশা কৰামতে নহয়।

আহু আৰু শালি ধানৰ বিষয়ে ডাকে কৈছে

'নপৰিলে আহু কিহৰ ধান
পৰিলে শালি তুঁহ পতান'।

শালিখেতি - ওখ মাটিত কাঠিয়াপাৰি শাওনৰ পৰা ভাদৰ ১৫ তাৰিখ মানলৈ শালি খেতি কৰাৰ ব্যৱস্থা লোৱা হয়। কেতিয়াবা বানপানী কম হলেহে খেতি পোৱা যায়। মধ্যমীয়া মাটিত আহাৰ মাহত হালবাই মাটি বোকাকৰি খুউব পাতলকৈ কঠিয়া সিঁচা হয় আৰু কঠিয়া গজি উঠিলে চাৰিওফালৰ আলিবোৰ বন্ধ কৰি দিয়া হয়। পাতলহোৱা বাবে কঠিয়াবোৰ চটাচট হয় শিপাও সৰ্ব সাধাৰণ কঠিয়াতকৈ বেছি হয়। ডাঠ হোৱা ঠাইৰ পৰা তুলি আনি অন্য ঠাইত ৰোৱা হয়। ইয়াকে পইৰা দিয়া বোলে। এনেধৰণে কৰা খেতি বানপানীয়ে ২-৩দিন বুৰাই ৰাখিলেও সহজে মাৰিব নোৱাৰে। এই পদ্ধতিত নানিয়া আৰু শ'লপোনা ধানৰ কঠিয়া দিব লাগে।

বাওধান - আগতে আহুৰ লগত বাও ধানৰ বীজ সিঁচাৰ কথা উল্লেখ কৰিছো। বাওধান সিঁচা আৰু ৰোৱা দুয়োটা পদ্ধতিৰে কৰিব পাৰি। দ-মাটি, মধ্যমিয়া মাটি আৰু

সাধাৰণ মাটিত কৰা জাত বিলাক বেলেগ বেলেগ। বাম চানেকীয়া মাটিত কৰা বাওধান - বুৰুলি বাও, বগিজুল আৰু ৰঙাবাও। মধ্যমীয়া মাটিত কৰা বাওধান - - খলিহৈ, ককুৰা। দ-মাটিত অসনা, নেঘেৰী আদি ।

বাওধানৰ বগিজুল আৰু বুৰুলি বাও কঠিয়া পৰিও ৰুব পাৰি। বানপানী শুকাই যোৱাৰ লগে লগে বাওধানৰ ঠাৰী বিলাক কাটি আনি ৰুলেও ভাল ফল পোৱা যায়। বাও ৰোৱা কাম শাওণৰ ভিতৰত কৰিব লাগে। এযাৰ কথা আছে--

"শাওণৰ পানী ৰাৱনে খায়
ভাদৰ পানীত ঘৰ তল যায়।"

ভাদমহীয়া পানীত ৫/৬ দিন বুৰি থাকিলেও পানী শুকাই যোৱাৰ পাছত গাঠি বিলাকৰ পৰা গজালি আহি পথাৰখন শুৱনি কৰি তোলে।

নদী কাষৰীয়া অঞ্চলত খলিহৈ বাও কৰিলে বানপানীত অহা বোকা পলসে পুতি পেলালেও পুনৰ গজালি আহি সজল সফল হয়। আহাৰ মাত ডাঙৰ বানপানী নাহিলে বিশেষ ক্ষতি নহয়।

মাহ খেতি - চাপৰি অঞ্চলত কহুৱা আৰু বিৰিণা উদ্ভিদ বেছি হয়। কৃষকে তেনে নতুন মাটিত কহুৱা আৰু বিৰিণা কাটি মুঢ়া খান্দি মাটি মাহৰ খেতি কৰে। সেই মাটিক দিয়া তলি বোলে।

ডাকে কৈছে-

'ভাদৰ চাৰি আহিণৰ চাৰি
মাহ সিঁচিবা যিমান পাৰি'।

মাহ তুলি সেই ঠাইত (দিয়া তলি) আহু খেতি কৰা হয়। এনে ধৰণৰ মাটিত আহুখেতি ভাল হয়। সেই একেদৰা মাটিত আহুৰ পাছত সৰিয়হ খেতি কৰে। একেদৰা মাটিত গুণাগুণৰ ওপৰত নির্ভৰ কৰি মাটি মাহ, আহু আৰু সৰিয়হ খেতি কৰিব পাৰি। যি বিলাক মাটিত একেৰাহে ২-৩ টা খেতি কৰাৰ পাছত বাৰিষা পলস পৰি বা বানপানীত তলযোৱাৰ পাছত ভাদমহীয়া হাল নোৱোৱাকৈ মাটি মাহ সিঁচি দিয়ে তাকে টোপা দিয়া বোলে। মাটি মাহৰ বাদে মগু মাহ টোপা দিলে নহয়। দুচাহ হালবাই মাটি মাহ সিঁচি মৈ দিও খেতি কৰা হয়। এনেদৰে টোপা দিয়া মাহৰ গছবোৰ বিশেষ ডাঙৰ নহয় যদিও উৎপাদন হ্রাস নহয়। মগু মাহৰ খেতি অলপ দ চানেকীয়া মাটিত কৰা হয় আৰু বাম মাটিটো কৰা হয়।

মটৰ মাহ - বাওধান দিয়া মাটি কোমল হৈ থাকিলে মটৰ মাহো মাটি মাহৰ দৰে (টোপা) জোৰেৰে চতিয়াই দিয়ে যাতে কোমল মাটিত মাহ সোমাই যায়। হাবি কাটি নতুন মাটিতো দুচাহ বাই মটৰ মাহ সিঁচে। মুকলি মাটিতো দুচাহ হালবাই মটৰ মাহ সিঁচে। মটৰ মাহ বৰষুণত অহাৰ আগতে চপাব লাগে। শেহতীয়া হ'লে বৰষুণত মাছ বিলাক কলা পৰি দাগী হয়।

কৃষকে তিথি বাৰ চাইহে মাহ সৰিয়হৰ খেতি কৰে। ডাকে কৈছে-

'শীত সৰিয়হ মীত মাহ
শৰণত নাকাটে বেত বাঁহ'।

অর্থাৎ পঞ্চমী, সপ্তমী, অষ্টমী, নৱমী, দশমী তিথিত মাহ নিসিঁছে। একাদশী, দ্বাদশী, ত্রয়োদ্বশী তিথিত সৰিয়হ নিঁসিছে।

সৰিয়হ - শীত কালৰ আগমনৰ লগে লগে সৰিয়হ খেতিৰ ব্যৱস্থা কৰা হয়। মুঠতে সৰিয়হ দুবিধ - সর্বসাধাৰণ ক'লা ৰঙৰ সৰিয়হ আৰু বগা সৰিয়হ। দ চানেকীয়া মাটিত আহু খেতি কৰা ঠাইত ভাদমহীয়া পানী শুকাই যোৱাৰ পাছত আহিন মাহত মাটি চহোৱাৰ কাম আৰম্ভ হয় আৰু মাটিৰ গুণাগুণৰ ওপৰত নির্ভৰ কৰি আহিনৰ ১৫ তাৰিখৰ পৰা কাতি মাহৰ ২০ তাৰিখৰ ভিতৰত সৰিয়হ সিঁচি আদায় কৰে।

ইয়াৰ উপৰিও বালিঅহীয়া মাটিত ফাগুণ - চ'ত মাহত ধনচা খেতি কৰি ভাদৰ ভিতৰত কাটি মাটিত পেলাই দি পাতবোৰ পচিবলৈ দিব লাগে। তাৰ পাছত হালবাই সৰিয়হ সিচিব লাগে। ধনচাৰ অৱশিষ্ট মৈ দিওতে ওলালে পথাৰত মেলি দিব লাগে। কিয়নো ডাঙৰ বৰষুণ হলে পুলিবোৰ অনিষ্ট কৰিব নোৱাৰে। বুঢ়ালোকে কয় -

'আহাৰে আহিনে সম
ভাদয়ো নাপায় গম'।

আহিন মাহৰ শেষৰ ফালে আৰু কাতি মাহত প্রায়ে বৰষুণ হয়। আজি কালি বতৰৰ দ্রুত পৰিৰ্বতনে বৰষুণৰ পৰিমাণ কমিছে। আমাৰ কৃষক সকলে স্থানীয় জাতৰ সৰিয়হ খেতি কৰে।

আলু খেতি - শীতকালত আলু খেতি কৰা হয়। প্রতিঘৰ মানুহে কম বেছি পৰিমাণে আলু খেতি কৰে। আলু খেতিয়ে আমাৰ দৈনন্দিন চাহিদা পুৰণ কৰাৰ উপৰিও ব্যৱসায়িক দিশতো ই আমাক আর্থিক ভাৱে সকাহ দিয়ে।

ক) ধনচা খেতি কৰা ঠাইটো আলু খেতি কৰা হয়।

খ) গৰু মহৰৰ গোৱৰ আলু কৰা থলীত জমা কৰি ৰাখি হাল বোৱাৰ লগে লগে মাটি ডৰাত বহলাই মেলি দি শুকাবলৈ দিব লাগে। গোবৰখিনি শুকুৱাৰ পিছত মৈ দি মাটিৰ লগত মিহলাই হালবাই চাহ কৰি লব লাগে। মাটি ভালদৰে চাহ কৰি শুকাইহে আলু দিব লাগে।

গ) ব্ৰহ্মপুত্ৰৰ চাপৰি বিলাকত কহুৱা খাগৰি গজি উঠে কাৰণে তাত গৰু খুটি দিয়ে। বালিচহীয়া মাটিত গৰু মহৰ গোবৰ আৰু মত্ৰই ৰবি শস্যৰ খেতিৰ উপযুক্ত কৰি তোলে। সেয়েহে এনে ঠাই আলু মূল আদিৰ খেতি কৰা হয়।

ঘ) পথাৰত মাহ মৰা ঠাইক খোলা খুলি কোৱা হয়। মাহ মাৰি শেষ হলে কটালীবোৰ বাৰিষা গৰুৰ খাদ্যৰ কাৰণে সংৰক্ষণ কৰা হয়। খোলা খনৰ আশে পাশে মাহৰ ঘোওলাবোৰ সিঁচি হাল বাই থৈ দি মাটিৰ লগত মিলাই থব লাগে। এনে কৰিলে ঘুগুলাবোৰ সোনকালে পচি যায়। চ'ত মাহত পুনৰ হালবাই মৰাখেতি কৰিব লাগে। মৰা কটাৰ পাছত সেই ডৰা মাটিতে আলু খেতি কৰিব পাৰি। আলু খেতিত গৰু মহৰ গোবৰ সাৰ ব্যৱহাৰ কৰাৰ উপৰিও ছাগলী গোবৰ শুকাই গুৰি কৰি আলুৰ খল বিলাকত চটিয়াই দি আলুৰুলে পোক পৰুৱাই অনিষ্ট কৰিব নোৱাৰে আৰু ফচলো ভাল হয়।

ঘেহু খেতি - ঘেহুখেতি দ চানেকীয়া ৰসাল সাৰুৱা মাটিত কৰা হয়। অক্টোবৰ মাহৰ ভিতৰত ঘেহু কঠীয়া সিঁচিব লাগে। শেহতীয়া হলে চপোৱা সময়ত বতৰে বিধি পথালি দিয়ে। তাৰোপৰি ঘেহুৰ ঠোকবোৰ ছুটী হয়। প্ৰতিবিঘা মাটিত নিৰ্দ্দিষ্ট পৰিমাণৰ জোখতকৈ অলপ বেছি সিঁচিব লাগে। ঘেহু গজালি ওলোৱালৈকে চৰায়ে খায়। ফাগুনৰ শেষত বা চ'তৰ প্ৰথম সপ্তাহৰ ভিতৰত ঘেহু চপাব লাগে। চ'ত মাহৰ শেষৰ ফালে বৰষুণ আহে আৰু ঘেহুৰ খাকি বিলাক পানী সোমাই গজালি মেলে। ৰ'দ বতৰত মৰণা মাৰিব লাগে। ভাল ৰ'দ নাপালে ঘেহু নসৰে। মাজে মাজে টোকোনেৰে মৰিয়াব লগা হয়। সকলো খেতিৰ ভিতৰত ঘেহু মৰণা সহজে নমৰে।

ঘেহুৰ কটালিবোৰ মৰণামৰা পাছত পুৰি পেলাব নালাগে। আদা আৰু হালধী খেতিত ব্যৱহাৰ কৰিব পাৰি।

কুঁহিয়াৰ খেতি - আমাৰ কৃষকে ঘাইকৈ গুৰ প্ৰস্তুত কৰিবৰ কাৰণে কুঁহিয়াৰ খেতি কৰে। কুঁহিয়াৰ খেতিৰ কাৰণে পানী জমা নোহোৱা এঢলীয়া বাম মাটিৰ

প্রয়োজন। মাটি দকৈ চহাব লাগে আৰু কোৰ মাৰিব পৰা ব্যৱস্থা ৰাখি ১ ১/২হাত বা ২ হাতৰ ব্যৱধানত লোৰ খান্দিব লাগে। লোৰ বিলাক অলপ দ হ'ব লাগে। নাঙলৰ শিৰলু টানিও কুঁহিয়াৰ ৰুব পাৰি কিন্তু বেছি ওখ জাতৰ কুঁহিয়াৰ হলে বতাহত সোনকালে হাউলি পৰে। লোৰ বিলাক পচন সাৰ, শুকান গোবৰ আৰু খলিহৈ গুৰি দিব পাৰিলে ভাল। খলিহৈয়ে উই পৰুৱা ধবংস কৰে। আগবোৰ লোৰত দিওতে ইদালে সিদালে লগ লগাই দিব লাগে। কুঁহিয়াৰৰ জাতবোৰ এনেধৰণৰ- চেনি কুঁহিয়াৰ, আঁকাপুৰা, পিয়াজী, ৯৯৭ প্রধান। খল বিলাক খান্দোতে পূৰা পশ্চিমা হলে ভাল হয়, কিয়নো পশ্চিম দিশৰ পৰা অহা বতাহ সহজে পাৰহৈ যাব পাৰে। এঢলীয়া মাটিত পানী ওলাই যাব পৰাকৈ খল দিব লাগে। ৰ'দ বতৰত কুঁহিয়াৰত কোৰ মাৰিব লাগে। প্রথমবাৰ কুঁহিয়াৰৰ আগ লগাই খেতিকৰা পাছত দ্বিতীয়বাৰ শুকানপাটবোৰ বাহিৰলৈ উলিয়াই আনি পুনৰ কোৰ মাৰি দিলে ভাল ফচল পোৱা যায়। ইয়াকে মুঢ়া কুঁহিয়াৰ বোলে।

'তিনি পো ছয় নাতি,
তেহে কৰিবা কুঁহিয়াৰ খেতি'।
কুঁহিয়াৰ খেতিত শ্রমিকৰ প্রয়োজন বেছি।

কলখেতি -বানপানী সঘনাই হোৱা অঞ্চলত সকলো জাতৰ কলখেতি কৰাটো সহজ নহয়। মালভোগ, চেনিচম্পা, জাহাজী এই কেইবিধ কলে পানী সহ্য কৰিব নোৱাৰে। আঠীয়া কল, কেতেকী সোন্দা, জাতিকল এই কেইবিধৰ ভিতৰত আঠিয়া কলৰ গুৰিত ৫/৬ দিন পানী থাকিলেও সহজে নমৰে। সেয়েহে বানপানী অধ্যুষিত অঞ্চলত আঠিয়াকলৰ উৎপাদন বেছি। বাৰিষা আঠিয়াকল কাটি ভুৰ সাজি মানুহে প্রাণ ৰক্ষা কৰাৰ উপৰিও পোহনীয়া গৰু - ছাগলী আদি ভুৰত ৰাখিব পাৰে আৰু খাদ্য হিচাপেও দিব পাৰে। ওখ ভেটি বান্ধি ঘৰৰ আশে পাশে জাহাজী, চেনীকল আদি ৰুব লগা হয়। জাহাজী কলৰ ওখ জাতটো পানীত সোনকালে মৰে আৰু চাপৰ জাতটো ২/৩ দিন সহ্য কৰিব পাৰে। বানাক্রান্ত অঞ্চলত আহিন মাহতে বেছি কলপুলি ৰোৱে। বহাগ মাহত ৰুলে জেঠৰ শেষত অহা বানপানীত কলৰ শিপাবোৰ পচি প্রায়ে মৰি থাকে। কলখেতিৰ সম্পর্কত ডাকে কৈছে -

'তিনিশ যাঠি জোপা ৰুৱা কল।
মাহেকে পযকে চিকুনাবা তল
পাত পচলা লাভত খাবা।
লঙ্কাৰ বনিজ ঘৰতে পাবা।'

কোনবিধ কলৰ গুৰিত কেনে ধৰণৰ সাৰ প্ৰয়োগ কৰিব লাগে ডাকে তাৰো নির্দ্দিষ্ট কৰি দিছে -

কল বোৱা সম্পর্কত ডাকে কৈছে -

'আঠিয়াত গোবৰ, মনোহৰত জাবৰ।
পু�ৰাত খাই, মালভোগত চাই।'

মৰাপাট খেতি - মৰাপাট খেতিৰ কাৰণে পলসুৱা বালি অহীয়া মাটি লাগে। আমাৰ অঞ্চলত তিতামৰা জাতৰ খেতি কৰা হয়। মাহ-সৰিয়হ মৰা খোলাত মৰাপাট খেতি কৰিলে ভাল হয়। মাটি ডৰা দুই বা তিনি চাহ হালবাওতে গোবৰ আদি পচন সাৰ চয়িটাই দিব লাগে। মাটিডৰা ভালকৈ চাহ কৰি মৰাপাটৰ বীজ সিঁচিব লাগে। সিঁচাৰ ২০/২৫ দিনৰ মূৰত বন-বাত নিৰণি কৰিব লাগে আৰু আহুধান বিন্ধোৱাৰ দৰে বিন্ধাই দিব পাৰিলে ভাল। দ চানেকীয়া মাটিত ফাগুনৰ শেষৰ ফালে আৰু বাম মাটিত চ'ত মাহৰ ভিতৰত মৰাপাটৰ বীজ সিঁচা হয়। জন বিশ্বাস মতে গৰু বিহু দিনা সিঁচা মৰাপাটৰ পঘাৰে গৰু বান্ধিলে মহামাৰী ৰোগ প্ৰতিৰোধ হয়। মৰাপাটৰ খেতিত বিচা পোকৰ আক্ৰমন বেছি হয়। তেনে হোৱা দেখিলে মানচাদা পানীত মোহাৰি সেই পানী চটিয়াই দিলে উপকাৰ পোৱা যায়। মৰাপাটৰ গুটি সিঁচাৰ পৰা কটালৈকে প্ৰায় চাৰিমাহ সময় লাগে। মৰাপাট কাটি ডাঙৰ আৰু সৰু ভাগ কৰি পোলা বান্ধিব লাগে। ডাঙৰ খাল, বিল. পুখুৰী আদিত মৰাপাট গোৰাব লাগে। ভুৰবান্ধি দি ওপৰত ধানখেৰ মেটেকা আৰু অলপ মাটি দিব লাগে যাতে মৰাপাট খিনি সম্পূর্ণ পানীৰ তলত থাকে বা বুৰ যায়। মৰাপাট গোৰ লবলৈ বন্ধ পানীত ২০/২৫ দিন লাগে। গোৰ লোৱা মৰাপাটবোৰ ঠাৰিৰ পৰা এৰুৱাই পৰিস্কাৰ পানীত ধুই শুকাব লাগে। ই এটা অর্থকৰী শস্য।

জন বিশ্বাস মতে - বতৰৰ আগলি বতৰা

১) গধূলি ৰঙ্গাবঢ়া কৰোতে পাকঘৰৰ পৰা ওলোৱা ধোৱা আৰু গৰুক জাগ দিওঁতে ওলোৱা ধোৱা কুণ্ডলী পকাই ওপৰলৈ গ'লে পিছদিনা বতৰ ফৰকাল থাকিব। ইয়াৰ বিপৰীত হ'লে বৰষুণ বা বতৰ ডাৱৰীয়া হ'ব।

২) সূর্য্যাস্তৰ সময়ত ৰঙা হৈ সূর্য্যস্ত হোৱা কিন্তু ইযাৰ বিপৰীত ৰং হ'লে বৰষুণ সম্ভৱনা। Evening gray morning red farmer goes rain on head.

৩) খৰাঙৰ পাছত বোন্ধা কেচু ওলোৱা বৰষুণৰ সংকেট।

৪) ব'হাগ মাহৰ এক তাৰিখে দোক মোকালিতে গোহালীৰ গৰু থিয় হৈ থাকিলে বছৰটোত বৰষণৰ মাত্রা বৃদ্ধি হয়।

৫) পাতৰ পৰা গছ হোৱা গছত ফুল ফুলিলে বৰষণৰ সম্ভাৱনা। (কোনো কোনোৱে পাৰিজাত ফুল বুলি কয়।)

৬) আঘোন মাহত যি যি তাৰিখে যিমান সময়লৈকে কুঁৱলী থাকে আহাৰ মাহৰ সেই সেই তাৰিখত সিমান সময়লৈকে বৰষণ দিয়ে। কুঁৱলীৰ ঘনত্ব অনুসৰি বৃষ্টি হয়। ঘন কুঁৱলী হ'লে ডাঙৰ বৰষুণ, কুঁৱলী কমহ'লে পাতল বৰষুণ।

৭) ঘৰ চিৰিকা চৰায়ে ধুলিত গাধুলে বৰষুণৰ সম্ভাৱনা।

৮) মৌপিয়া চৰায়ে কিউ কিউ কৰি মাতিলেও বৰষুণৰ সম্ভৱনা।

৯) পাৰ, শালিকা আৰু কাউৰীয়ে পানীত গা ধুলে বৰষুণৰ সম্ভৱনা।

১০) পাতি হাঁহে ওপৰলৈ মুখ কৰি জোৰদি চিঞৰিলে বৰষুণ হোৱাৰ সংকেট দিয়ে।

১১) মৌৰা চৰায়ে চালি ধৰিলে বতৰ ডাৱৰীয়া হৈ বৰষুণ হয়।

১২) উদঙীয়া গৰু সময়তকৈ যদি আগতে জাকপাতি নেগুৰ দাঙি আহে ক্ষন্তেক পিছতে বৰষুণ হয়।

১৩) খৰাং বতৰত যদি ভেকুলীয়ে টোৰটোৰালে বৰষুণ দিয়াৰ ইংগীত বহন কৰে।

১৪) গাত খৰ থকা মানুহৰ খৰৰ খজুৰতী বেছি হলে বতৰডাৱৰীয়া হৈ বৰষুণ হয়।

১৫) দক্ষিণ দিশৰ বাদে অন্য দিশত বিজুলী মাৰিলে বৰষুণ হয়।

১৬) **উত্তৰে গাজিলে মাৰিবা লৰ**
দক্ষিণে গাজিলে জানিবা খৰ
পশ্চিমে গাজিলে নুমাবা জুই

পূৱে গাজিলে থাকিবা শুই।।

১৭) **পূৱে গাজিলে ধান, উত্তৱে গাজিলে বান।**
দক্ষিণে গাজিলে হানে, পশ্চিমে গাজিলে আনে।।

১৮) বগলী চৰাই যদি পথাৰত জাকপতি পৰে বৰষুণ হোৱাৰ সম্ভৱনা।

১৯) খৰাং বতৰত চেঙেলী মাছ বামলৈ যদি উঠে তেতিয়াও বৰষুণৰ আগজাননী বুলি ধৰিব পাৰি।

২০) বতৰ ফৰকাল হৈ থাকোতে পশ্চিম দিশত আবেলি সময়ত জাক পাতি বগলী উৰিলে বতাহ - বৰষুণ আহে।

২১) কুকুৰে পুখুৰী বা বিলত নামি পানী খালে ২/১ দিনতে বৰষুণ হোৱাৰসম্ভৱনা।

২২) বৰল আৰু কোদোৱে ওখ ঠাইত বাহ সাজিলে সেহ বছৰ ডাঙৰ বানপানী হয় বুলি কোৱা শুনা যায়।

২৩) মানুহৰ কান খজুৱালে বতৰডাৱৰীয়া হৈ পাতল বৰষুণ হয় বুলি কোৱা শুনা যায়।

২৪) আমাৰ পৰম্পৰাগত বিশ্বাস আছে যে, চুক ভেকুলীয়ে টোৰটোৰালে বৰষুণৰ আগজাননী দিয়ে।

বাৰিষা কালত বেঙৰ ৰাও
হালগৰু লৈ পথাৰলৈ যাওঁ।

<u>ডাকৰ বচন - কৃষি প্ৰকৰন</u>

অসম এখন কৃষি প্ৰধান ৰাজ্য। ডাকৰ বচন সমূহত কৃষি কৰ্মৰ উপৰিও জন্ম প্ৰকৰণ, গহ লক্ষণ, শস্য মাত্ৰা বৰ্ষা লক্ষণ, কৃষি লক্ষণ, হল প্ৰকৰন, ৰন্ধন প্ৰকৰন, জ্যোতিষ আদি বিভিন্ন বিষয়ত দিহা পৰামৰ্শ অন্তৰ্ভুক্ত হৈ আছে। আমি কৃষি কৰ্মৰ ওপৰত উপস্থাপন কৰিবলৈ প্ৰয়াস কৰিছো।

ডাকে কৈছে -

'ডাকে বোলে বাপু শুনা উপায়।
বানিজ্যৰ ফল কৃষিতে পায়।
যিজনে সদা কৃষিক কৰে।
সমস্ত সফল পাইবে ঘৰে।'

অসমৰ সকলো অঞ্চলতে ধান খেতি কৰে। ভাত হ'ল আমাৰ প্ৰধান খাদ্য। সেয়েহে ডাকৰ বচন –

'ধনৰ মাজত ধানৰ শোভন।
ধান নহ'লে তেখেনে মৰণ।।
এতেকে কৃষিক কৰিবা সাৰ।
কৃষিতে দুৰ্ভিক্ষ হ'ব নিস্তাৰ।।
ধান হলে হোৱে সবে মঙ্গল।
তাহাৰ অভাৱ সবে বিফল।।'

শালি তলিত কেনেকৈ পানী ৰাখিব লাগে সেই বিষয়ে ডাকে কৈছে

ডেৰিয়া ভূমিক লোৱে সুবুধি।
ঘন আলি দিবা সবাক সুধি।।

এনেদৰেও পোৱা যায় পৰ্বতৰ টিঙত কৰিবা শালি।

ঘন ঘনকৈ দিবা আলি।।
আহিন কাতিত ৰাখিবা পানী।।
যেনেকৈ ৰাখে ৰজাৰ ৰাণী।

ধান ৰোৱাৰ বিষয়ে ডাকৰ বচন এনেধৰণৰ

আহু ৰুৱা খোজত বুৰি।
শালিৰুৱা বেগত জুৰি।।
আঠুৰ ওপৰে থাকে পানী।
হাতেকতে গোছা দিবা জানি।
যেবে দেখা নহয় শালি।
তেতিয়া পাৰিবা ডাকক গালি।।

আমাৰ কৃষক সকলে ধান খেতিৰ উপৰিও মাহ, সৰিয়হ, কল, তিল আদিৰ খেতি কৰে এই বিষয়ত ডাকৰ বচন এনেধৰণৰ

য'ত লাভ পায় সৰিয়হ মাহে
তত লাভ পাই কলা কপাহে
যথাত কলা কপাহৰ বাৰী
তথাত লুভীয়া সকল নাৰী।

কল খেতি কপাহ খেতিযে ঘৰৰ পৰা দূৰত কৰিব লাগে তাতো নির্দ্দিশ দিছে ডাকে

কল কপাহ আর্জিব দূৰ
ওচৰত ভৈলে দোষ প্রচুৰ।

খেতি যাতে নষ্ট নহয় তাৰ বাবে বেৰা দি ৰখাৰ বিষয়ে ডাকে কৈছে।

মাহ সৰিয়হ কলা কপাহ
চাৰিকো খালে নাহিকে আশা।
কৃষি ৰাখিবা বেৰি যতনে।
সফল কৃষি মানিবা মনে।।

মাহ, সৰিয়হ, কপাহ আৰু বাঁহ খেতিৰ বিষয়ে ডাকে কৈছে

ভাদৰ চাৰি আহিনৰ চাৰি।
মাহ সিচিবা যিমান পাৰি
ঘন সৰিয়হ পাতল মাহ
আৱৰণ দিবা কপাহ বাঁহ।।

মাহ সৰিয়হ যি খেতিকে নকৰক গৰু ছাগলীৰ পৰা ৰক্ষা কৰিবলৈ জেওৰা অর্থাৎ বেৰা দিব লাগে। এই বিষয়ে উল্লেখ কৰি অহা হৈছে।

কল খেতি এটা অতি লাভজনক ব্যৱসায়। এই খেতি সম্পর্কত কলপুলি ৰোৱাৰ পৰা কোনবিধ কলত কি সাৰ প্রয়োগ কৰিব লাগে তাৰো নির্দ্দেশ ডাকে দিছে–

এহাত এমুঠন কলৰ পোত
তেহে চাবা ফলৰ গোট
তিনিশ যাঠি জোপা ৰুবা কল
মাহেকে পযকে চিকুনাবা তল
পাত পচলা লাভত খাবা
লঙ্কাৰ বনিজ ঘৰতে পাবা
আঠীয়াত গোবৰ মনোহৰত জাবৰ
পুৰাত খাই মালভোগত ছাই।

কুঁহিয়াৰ খেতিৰ প্রক্রিয়া দীঘলীয়া। শ্রমিকৰ প্রয়োজনো আন খেতিতকৈ বেছি লাগে। সেয়ে ডাকে কৈছে

ছয় পো ছয় নাতি
তেহে কৰিবা কুঁহিয়াৰ খেতি।

অসমীয়া মানুহৰ তামোলপান জীৱনৰ এৰাব নোৱাৰা সংস্কৃতি । সেৱা-সকাম, বিয়া-সবাহ আদিত তামোল-পান বিশেষ প্ৰয়োজন। অতিথিকো প্ৰথম তামোল এখনহে আগবঢ়াই দিয়া হয়। তামোল গছ ৰোৱা আৰু পানৰ সম্পৰ্কত ডাকৰ বচন এনে ধৰণৰ

সাতে পাতল পাঁচত ঘন
ছয় হাতে তামোল নদন বদন।
কোনো কোনোলোকৰ মুখত শুনা যায়
লাগে তামোল নালাগে
নালাগে তামোল লাগে।

অৰ্থাৎ তামোল গছ ইজোপাৰ পাত সিজোপাৰ পাতে পাতে লাগি থাকিলে তামোলৰ উৎপাদন হ্ৰাস হয়। পানৰ সম্পৰ্কত ক'লে - তিনি শাওনে পান এক আহিনে ধান। জালুক আৰু পানত বৃদ্ধিৰ বাবে গুৰিত কি দিব লাগে তাৰো পৰামৰ্শ ডাকে দিছে

জালুকত গোবৰ পানত মাটি
কলপুলি ৰুৱা তিনিবাৰ কাটি।

ডাকৰ এই বচন সমূহ অসমৰ কৃষকে অতীজৰ পৰা মানি আহিছে। খেতিত ৰ'দ আৰু বৰষুণৰ প্ৰয়োজন সেই বিষয়ে ডাকে ক'লে -

ৰ'দে বৰষুণে সমে যায়।
তেবেসে কৃষিৰ লাভক পায়।।

(বচন সমূহ 'সম্পূৰ্ণ ডাকৰ বচন' হেমৰথ বৰ্মনৰ পৰা সংগ্ৰহ কৰা হৈছে)

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Dakor Boson: Antique Verses of Assam Enriching Agriculture

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Agriculture has governed pivotal role in the socio-economic life of the state of Assam in India. Farmers have developed their own systems and strategies in cultivation of various crops. Being endowed with resourceful biodiversity, Assam is a state with diversified crops and their unique varieties. Ethnic diversification, their isolation, as well as intermingling of cultures have brought about a variety of cultivation practices and uses of the agricultural products.

Dakor boson are popular verses among the rural population of Assam. Although there are many traditional beliefs and practices, *Dakor boson* are treated as divine preachings for all social ceremonies starting from birth to death, sowing of a crop till its harvest, animal husbandry, fishery, medicines, and so on. Preachings of *Dak* are popular not only in Assam but also in the state of West Bengal and adjoining areas. These are not superstitions but seem to be an accumulation of wisdom gained through experience. These preachings are value based and constitute oral literature that has been in use for many generations. There are at least two schools of thoughts regarding *Dak.* One group thinks that the verses are an accumulation of teachings of a group of learned people while the other group thinks that the verses have been put forth by an extraordinarily intelligent person named *Dak* (Barman, 1977). Whatever the case may be, people in Assam are accepting them in their daily life and agriculture is no exception.

In this article, the word *Dak* is used to designate a person. A few important verses of *Dak* related to agricultural practices are

discussed. However, these are not exhaustive. There are many more verses in the form of folklore prevailing in different communities of Assam.

Agriculture

Dak seems to be a real advocator of agriculture. So, one of his verses goes like this:

Dake bule bapu suna upai
Banijyar phal krishite pai.

For making profits as in business, one should engage himself in agriculture. In Assamese society, the *sadagar* or businessmen were regarded as wealthy persons. Therefore, business was considered to be a money-earning profession. However, in the following verse *Dak* has advocated hard work in agriculture to be able to earn money like in business:

Ji nore sada krishik kore
Bepar phal paibe ghare.

Dak appeals for hard work in agriculture. One cannot get benefits of agriculture without providing proper care to the crops. The verse says:

Krishi kariba ekanto mone
Nofole kirishi bina jatane.

"One must dedicate his heart and soul to cultivation to reap a bumper harvest."

Layout of homestead

An Assamese family in the village invariably possesses a homestead which caters to the needs in their daily life. *Dak* has suggested a layout of the area around the dwellings. The saying goes like this:

Pube hanh, pachime banh
Uttare gua, dakhine dhowa.

This verse means that one has to construct the duck-rearing house on the eastern corner of the household (duck is an important component of farming systems in Assam), while on the western side, planting of

bamboo *(Bambusa arundinacea* (Retz.) Willd.) is suggested (bamboo also plays an important role in the daily life of the people). On the northern side, *Dak* has suggested to plant areca nut *(Areca catechu* L.) which is also an integral part of Assamese culture. On the southern side, a pond should be dug which helps in rearing fishes and acts as a source of water for cleaning and washing.

Weather forecast

Agriculture in Assam depends on rain. *Dak* gives some tips on weather forecasting based on some observations. In one of his verses he says:

Ame baan Kothale dhan.

If mango *(Mangifera indica* L.) bearing is very high, occurrence of flood is certain while if bearing of jackfruit *(Artocarpus heterophyllus* Lam.) is more, bumper harvest of rice *(Oryza sativa* L.) can be predicted; i.e., the weather will be normal.

For immediate forecasting of rain there is an interesting verse which is very popular amongst the people:

Uttare gajile janiba khor
Dhokhine gajile mariba lor
Pube gajile janibe paan
Paschime gajile janiba baan.

The verse says:

"If lightning is in the northern side, there is drought ahead.
If lightning is in the southern side, one should try to run.
If lightning is in the east, betel vine will be profuse.
If lightning is in the west, flood is expected very soon. "

In addition, in another verse, *Dak* predicts crop yield based on prevailing weather conditions:

Rode barishane same jai
Tabese krishik labhot pai .

If sunshine and rain are equally distributed one should expect a good harvest. The sky in Assam during *sali* rice growing season remains overcast. This results in reduction of photosynthetic activity causing reduction in yield. That is why sufficient sunshine might be beneficial for high rate of photosynthesis while well distributed rainfall is also desired for high water requirement of *sali* rice.

In another prediction *Dak* says:

Maghot raudro, Baishakat sheet
Sasimah aLpobristi bhumit
Maghor seshot borishe paani
Tehe aLpa bristi agoLoi jaani.

If there is sufficient sunshine in the month of *Magh* (January-February) and cold in *Baishakh* (April-May), there will be scanty rain for four months. If it rains in the last week of *Magh,* drought is ahead.
On the intensity of rain of a particular day *Dak* says this:

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"If east is vermilion red and west is black
You know that rain will be sufficient.
If the sun is very hot early in the morning
There is no doubt it will rain cats and dogs."

There are many other verses which give indications of weather conditions or predictions of rain and drought to have contingency planning. Many such verses need to be understood. The deeper meaning of such rhymes may not be apparent from the words. These need to be evaluated critically. There is scientific basis in most of *Dakor boson* as the verses depend on observations made through long time experiences.

Tillage

On plowing for various crops, *Dak* suggests an interesting package:

Solla sahe mula
Tare adhay tula
Tare adhay dhan
Bina sahe paan.

This means for radish, sixteen plowings are required while cotton *(Gossypium* sp.) needs half of it, i.e., eight plowings (Here radish includes all crops belonging to *Brassica* family such as rapeseed *(Brassica napus* L.) and mustard *(Brassica* sp.), which are small seeded and require fine tilth). Four plowings are needed for rice but betel vine *(Piper betle* L.) requires no plowing. The present agronomic package also suggests 4-5 plowings for transplanting rice (Assam Agricultural University, 1998).

Crop production

Although rice is the major crop of Assam, yet importance of other crops cannot be ignored. Traditionally, rapeseed and mustard, mung bean *(Vigna radiata* (L.) Wilczek), and black gram *(Vigna mungo* (L.) Hepper), citrus *(Citrus* spp.), and banana *(Musa paradisiaca* L.) are being grown in the state. That is why a few folklores relate to these crops. One of *Dak's* verses means:

"Provide fence around your plot
Then only you can be successful.
Success depends how you mind your field
So grow the crops in near vicinity."

Dak insisted on growing crops in the vicinity of the household so as to enable the farmer to keep strict vigil on those. Stray cattle have been a problem for agriculture. That is why probably *Dak* appealed to provide fencing around the field.

Rice

Cultivation. Inhabitants of Assam and its neighboring states are rice eaters. Nothing seems to be more precious than rice. So *Dak* says:

Sona rupa kiba kore
Bhaat nakhale bhokot more
Hira monik thake opar
Khud gal nakhale morone saar.

The meaning is: "What will you do with precious metal like gold and silver if you do not have rice to eat? If you do not produce paddy you will die of hunger. Precious stones and diamonds are useless unless you eat rice."

In another valuable saying *Dak* emphasizes growing more rice, the most important staple food of the region.

Dhanor madhyat dhanyashe shobha
Dhan nohole mora totikhyane
Ateke krishit koriba saar
Durbhikhyat krishi kore nishar.

Amongst all property, rice is the most precious one. Without rice, one will die instantly. Therefore everyone should concentrate on growing more rice to eradicate famines. Famines seem to have occurred regularly in ancient Assam due to natural calamities and other factors. *So, Dak* has advised to grow more rice.

Rice-growing season in Assam starts in *Ashar* (June-July) when the seeds of *sali* rice are sown in nursery beds. Pre-monsoon showers in *Baishakh/Jeth* (April/May) are useful for primary tillage operations. However, in some years monsoon is delayed and the rice farmers face hardship. So *Dak* says:

Jeth mah goilo bina nangale
Tahar kimote krishi phole?

"How can one harvest if he cannot plow his field as early as *Jeth* (May)?"

Dak states that there should be shower on the 7th lunar day of *Magh* (i.e., early February). The farmer should then get his implements ready. He should leave aside everything but repair and clean his farm implements. The verse goes like this:

Maghi saptamite barishe deo
Roya ari kora nangal sew.

A verse carrying similar meaning is mentioned in Krishi-Parashara (Verse 38) (Sadhale, 1999).

Tillage. Besides *sali* or winter rice, there is another class of rice called *ahu* or autumn rice, which is planted in April. It is grown by direct sowing on the onset of pre monsoon showers. *Ahu* varieties are short duration types unlike *sali* varieties. Therefore, plant spacing is adjusted according to the tillering ability of the varieties. *Dak* suggests closer spacing for *ahu* but wider planting for *sali* through this verse:

Ahu ruba khujot buri
Sali ruba begot juri.

Again, spacing varies with the depth of water in the rice field. So, one of the verses goes like this:

Athur upore thake paani
Hat garte gos diba jani.

"When water is knee-deep, one should plant rice in wider spacing."

Time of planting. *Sali* rice is normally transplanted in the month of *Shawn/Bhado* (August/September). Farmers are sometimes forced to delay transplanting due to inclement weather, flood, or non availability of agricultural laborers. But delay in this operation reduces the yield significantly. Hence *Dak* says:

Saunor kothiya nohoy dhan
Ahinor gosh biphole jai.

Delayed sowing in the month of *Shawn* (August) and transplanting in the month of *Ashwin* (October) cannot produce anything. This is mainly because of the fact that indigenous *sali* rice are short-day varieties. Therefore, delayed planting will make the crop enter the reproductive phase without proper vegetative growth and thus the yield will be drastically reduced.

Seedling growth. *Dak* says that efficiency of a farmer can be judged from the quality of rice seedlings.

Bai gune bhinihi
Kothiya gune kirishi.

"If your sister is well mannered one can expect good behavior from her husband; similarly, if you are a hard working cultivator and can raise healthy (quality) seedlings, you can produce good seedlings of rice."

Water management. *Sali* or winter rice is grown under rainfed conditions in Assam. Farmers take advantage of high precipitation received during the period. However, in elevated areas it is very difficult to keep the water accumulated in the rice fields. On the water management in rice fields, *Dak* says:

Ghonai ghonai diba ali
Porbatoto ruba sali.

"If you make very close bunds in rice fields, you can restore water even on the hill top." For example, successful terrace cultivation practices in the slope of hills due to closure bunds.

Water management in the rice field depends not only on the number but also on the height of the bunds to maintain depth of water. So *Dak* verse goes like this:

Ali oporat diba ali
Kheti hol buli janiba bhali.

"If you can make bund over bund, you are sure to reap a good harvest."

Good harvest of *sali* rice also depends on the sound water management up to the panicle initiation stage of the crop. One of the *Dak* verses says:

Ahin katit rakhiba pani
Jenekoi raakhe rojai rani.

A king adores his queen with ornaments and provides her all comforts. Similarly, farmers should keep water in the rice field up to *Ashwin/Kati* (October/November), i.e., the time of panicle initiation of long-duration, photoperiod-sensitive *sali* rice.

Production. Success of a farmer depends on the production of rice in his field.

That is why the saying goes as:

Dhan hole howo sabe safal
Dhan nohole sakolo biphol.

"If you have bumper harvest of rice, you are successful in all aspects and if you do not get good harvest of rice, you fail in every sphere."

Pulses

Time of sowing. Mung bean and black gram are the most common pulses (grain legumes) grown in Assam since centuries. The best time of sowing of pulses as suggested by *Dak* is:

Bhador sari ahinor sari
Mah boba jiman paari.

The last four days of *Bhado* (September) and first four days of *Ashwin* (October) are the best time for sowing of pulses. Thus, only eight days are suitable for sowing of pulses.

Plant spacing. *Dak* suggests wide spacing for pulses in contrast to mustard for which close spacing is needed. So, the verse says:

Ghan sariah patol mah
Aboran diba kopah banh.

Some of the verses do not seem to have scientific basis. Yet people have been strictly adhering to such sayings in agriculture. For example:

Seet sariah meet mah
Saranat nuruba banh.

Dak has warned not to sow mustard on new moon day, 11th, 12th, 13th, and 14th lunar day while sowing of pulses have been prohibited on 5th, 7th, 8th, 9th, and 10th lunar day and planting of bamboo is not allowed at a specific time in the calendar.

Banana

In Assamese society banana has got versatile uses in various ceremonies (Gogoi *et al.*, 2007). *Dak* emphasized growing of banana in the homestead for it multifarious utility. Besides, they provide nutritional diet as well as medicinal supplement to the family members. A number of banana cultivars are grown in Assam and *Dak* suggests different manurial practices for different cultivars as follows:

Tiniso sathi jopa ruba kol
Maheke poseke sikunaba tol
Pat pasala labhot paba
Lankar banijya gharate paba
Athiyat gobar, Manoharat jabor
Purat khai, Malbhogat sai.

Dak urges the farmers to plant 360 banana trees and maintain them properly. Such an orchard will bring wealth to the family. For good production of different classes of banana, *Dak* suggests that one should apply sufficient cow dung for cv Athiya [highly seeded, has high TSS (total soluble sugar) content], while farm refuse is beneficial for cv Manohar. For Purakol, a cultivar used for culinary purpose, kitchen refuse with water is useful. Purakol needs regular watering. For Malbhog, another highly nutritious banana cultivar used for table purpose, application of ash is suggested. It is

worthwhile to mention that banana cultivars are highly responsive to potassic fertilizers and ash might provide potash to the plant.

Areca nut

Areca nut is another crop which is grown invariably in the homestead. Areca nut is consumed with betel leaf and lime and is a symbol of respect in Assamese culture. A package of practices for planting areca nut was suggested by *Dak* as:

Lage tamul nalage
Nalage tamul lage.

"If you plant areca nut so close that leaves of one plant touches the nearby plant there will not be any bearing; if you plant them apart, there will be good bearing."

Dak also suggests exact spacing for areca nut.

Sate patol, pase ghan
Soit tamul nadan badan.

Seven *haat* (hand) (approx. 3.5 m) is distant apart while five *haat* (approx. 2.5 m) is also close. Distance of six *haat* (approx. 3 m) between plants is the best spacing for areca nut (Assam Agricultural University, 1997).

On the areca nut plant, generally betel vine and rarely black pepper *(Piper nigrum* L.) vines are grown. *Dak* suggests sufficient application of cow dung to pepper and in soil near betel vine.

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Horticulture in Traditional Wise-sayings of Assam

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The traditional knowledge base of India in various spheres of agriculture still shows its worthiness in the context of modern agricultural concepts and practices. The vast body of such knowledge resources had originated as a result of long careful observation on various agricultural practices in predictable weather situations and ultimately certain rules were formulated to guide the farmers to follow proper agriculture practices in proper time. Since the rules are based on systematic observation over millennia, the predictions of such rules have good ground reality and thus such rules could be termed as traditional wise-sayings.

In the state of Assam in India, many popular wise-sayings are found which cover almost every aspect of human life and these sayings teach the common people about the wise ways of living and also livelihood. In the field of agriculture also such sayings are very popular among the farming communities of the state and direct the farmers to follow certain rules for varietal selection, time of planting, methods of planting, intercultural practices and methods of fertilization. In the present-day situations of modern agriculture also the sayings are popular and are frequently remembered at the time for various agricultural practices as good benefits could be derived by following such directive sayings. On the other hand, scientific basis out of very such wise-sayings could be restored as these are based on practical observation over a long period of time.

The wise-sayings are generally found as rhymed verses and it is commonly believed that these verses were created and preached by learned and experienced persons of rural community of the state since time immemorial. But many researchers of pristine writings postulate that the verses were put forward by an extraordinarily wise and farsighted person named 'Dak' (Dutta, 1961; Barman, 1977). Therefore, the wise-sayings are also popularly known as 'Dakor Boson' (The sayings of Dak) and the rural communities of Assam believe that these sayings are as truthful as the preaching is of the Vedas, the great Hindu religious treatise (*Dakor Boson Vedar Bani).* Based on the early literature, Dutta (1961) proposed that Barpeta district of Assam was the birthplace of intelligent Dak and he broadly estimated that Dak was born in 800-1200 AD. He also stated that such age-old popular wise-sayings spread from Assam to West Bengal, Nepal and adjoining areas in due course and still serve as common guiding principles for the common people in those areas. On the other hand, according to another school of thought, though the popular wise-saying are grouped under the term 'Dakor Boson', Dak was not the name of a particular person, but the word Dak refers to the great divine appealing values of the sayings in numerous practical aspects of human life right from birth to death. Thus it could be easily envisaged that regarding the origin of the sayings, there are differences in views as is evident from the ancient writings and it could be a subject matter of research in the domain of the ancient literature.

In this article, we examined the relevance of a few wise-sayings related to horticultural crops of Assam in particular context of modern agricultural systems and here the word Dak refers to the intelligent person as explained by Dutta (1961). Properly explained Dak's sayings will reflect the rich traditional wisdom of our country in the field of horticulture to the world scientific community.

Table 1. Traditional wise-sayings (*Dakor Boson*) on horticultural crops of Assam (India)

Wise-saying in Assamese	Meaning in English	Remarks

Planting time Saonor kol Ravaneo khai ses karibo noware.	If banana (*Musa* spp.) is planted in the month of *Saon* (July), its bearing is so profuse that the great demon king Ravan with ten heads will not be able finish the fruits.	To ensure the availability of water and proper temperature, banana should be planted in the middle of the rainy season. Research finding showed that banana planted in September produced poor bunch yield in Assam (Buragohain, 1995).
Phagune nokorile ol Sesot hoi gondogul.	Dak predicts that if yam (*Dioscorea esculenta*) is not planted in the month of Phalgun (February/March, the farmer will face problems.	Crop vegetative growth and tuber yield of yam is affected if planting is delayed. The crop gets congenial climatic atmosphere if it is planted in February-March. Day length of more than 12 hours at the early crop stage promotes vine growth, while short photoperiod favors tuber development in yam (Bose *et al.,* 1993)
Potol ruba Phagune Fal bahibo dugene.	To have a bumper harvest of pointed gourd (*Trichosanthes dioica*), Dak directs that planting should be done in the	The present agronomic package also suggests planting of pointed gourd in February

	month of *Phalgun* (February/March).	(Assam Agricultural University, 1997).
Varietal selection Mak valehe jeeyek jati.	Like mother like daughter.	Farmers of Assam popularly follow this wise-saying while collection planting materials/seeds for perennial fruit crops. For coconut (*Cocos nucifera*), areacanut *(Areca catechu),* and *citrus,* nuts/seeds are carefully collected from selected mother plants. In other species, planting materials like cutting, air layering's, etc. are collected from trustworthy, careful, and experienced farmers having a good homestead garden.
Ake gochor pan Si hobo ki an.	The leaves of betel vine (*Piper betle)* from the same vine are all the same	The saying refers to the fact that the performance of planting materials collected by vegetative method remains true to the type of the mother plant. Dak urges that the cutting of betel vine should not be taken from diseased

		mother plants.
Planting method *Ahat amuthan kalar put Tehe saba kalar gut.*	To have good fruit size of banana (Musa spp.), the depth of the pit for planting suckers should be slightly more than one's elbow length (finger tip to the elbow joint, approximately 0.5 m).	The recommended size of the pit for planting banana suckers is 45 cm^3 which corresponds to the size indicated by Dak.
Nadir kasha putiba kachu kachu bahibo tini hat uchu.	To have a good crop stand of taro (*Colocasia esculenta),* Dak advises farmers to cultivate it in riverside areas.	Tuber growth and development depends largely on the texture of the soil. Well drained, loose friable soils containing good amount of organic matter is preferred for planting taro. Near the riverside, sandy loam soils are fertile due to siltation and the crop grows well in such a soil situation.
Plant spacing *Satat patol, pachat ghan Sayat tamol nadon badon.*	The spacing of areca-nut plants will be wider and closer at seven (3.5m) and five (2.5m) elbow length respectively, but one could expect profuse bearing of nut at spacing of six elbow length (approx. 3m).	Through modern research it is evident that 2.75m spacing is best for areca-nut in Assam (Assam Agricultural University, 1997) and six elbow length closely corresponds to that spacing.
Lage tamol	If the leaves of one	Areca-nut should be

nalage Nalage tamol lage	areaca-nut plant touch the leaves of a nearby areca-nut plant, the spacing is close and bearing from such closely spaced plantations cannot be expected. Good bearings could be expected if leaves of one plant do not touch those of nearby plants.	planted at proper spacing (2.75m) for optimum yield.
Fertilization *Kachu rui diba sai Dake bole kachu bahi jai.*	Dak urges the farmers to fertilize taro crop with ash to have proper crop growth.	Application of sufficient quantities of organic manure and wood ash in the pits of taru at the time of planting is recommended. The wood ash contains good amount of potash which ultimately helps in tuber growth and yield.
Athiat gobor Manoharat jabor Purat khai Malbhogot sai.	Dak, from his observations, advises the farmers to follow different manorial practices for different cultivars of banana (*Musa* spp.) found in Assam. According to Dak, farmyard manure (FYM) should be applied to cultivar Athia	The banana cultivar Pura needs regular watering for good yield. The yield is good with kitchen refuse water. Potassium deficiency is a probable cause responsible for hard pulp in cultivar Malbhog. Wood ash

	(seeded variety), farm refuse materials to cultivar Manochar after weeding, kitchen refuse after lunch and dinner along with refuse water to cultivar Pura (culinary banana), and wood ash to cultivar Malbhog.	contains good amount of potash and helps in overcoming the disorder. Potash also helps in attaining good fruit size in Malbho.
Jalukot gobor panat mati Kol puli ruba tini bar kati.	Dak also advises different manorial and intercultural practices for betel vine and black pepper (*Piper nigrum*). He urges the farmers to apply FYM to black pepper and for proper earthing up in betel vine. In the same verse, he also advises banana growers to replant the banana plantations after harvest of three bunches.	In Assam, betel vine and black pepper are grown in areca-nut plantations. It is suggested that sufficient quantities of cow dung and soil should be applied to black pepper and betel vine, respectively which will helps in supply of nutrients and conservation of moisture near the base of the plant. In banana plantation, one main crop is followed by only two rations (Assam Agricultural University, 1997).
Intercultural operations *Tiniso sathi jopa ruba kol Maheke*	Dak advises the banana growers to plant 360 banana plants in one *bigha* (0.13 ha) of land	Through this saying, Dak advises the farmers to plant 360 banana plants in a

posheke sikunaba tol Pat pochola lavat khaba Lankar banij gharate paba.	and to maintain them properly by weeding at monthly and fortnightly intervals. He predicts that good business could be expected out of such a banana plantation. Young suckers and green leaves can be used for domestic purposes. In Assam, young banana plants are used as vegetables and the green leaves are used as dishes/plates in various religious ceremonies.	*bigha* of land. In experiments in Assam, a plant population of 410 plants per *bigha* of land at spacing of 1.8m×0.8m was recorded to be profitable for dwarf banana cultivars (Assam Agricultural University, 1997), which closely corresponds to the number suggested by Dak several hundred years ago.
Kol rui nakatiba pat Tatei kapor tatei bhat.	According to Dak, banana is a profitable crop which is still true in the present-day context. He urges the farmers not to cut the green banana leaves indiscriminately for domestic and religious purpose as they can easily earn their livelihood from properly maintained banana plantations.	All the parts of the banana plant are useful. Paper board, tissue paper, fruit products like banana chips, banana soft drink, flour and powder, jam, etc. can be prepared from banana. *Musa basjoo* yields fiber which may be made into textiles (Simmonds, 1966).

Indigenous Technological Knowhow in Insect Pest and Disease Management of Horticultural Crops in Assam

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Pesticidal residues are often present in various agricultural crop products and may be considered as one of the curses of modem agriculture. The problem arises out of indiscriminate use of pesticides and it becomes more complicated for those crops, which are consumed raw. Wide-scale use of such agrochemicals kills beneficial organisms and disturbs the natural equilibrium of the ecosystem. So, researchers are now emphasizing use of alternative eco-friendly and health-hazard free methods of pest management. The concept of integrated pest management (IPM) was developed as a potential strategy for reduction in use of pesticidal chemicals. IPM focuses on the traditional eco-friendly methods of pest management, which are being practiced by farmers from time immemorial. Such pest control methodologies are grouped under the term "Indigenous Technological knowhow" (ITK) and these technologies have great scope in contributing towards pesticidal residue-free agricultural-free agricultural products.

A survey was conducted during 2001-02 in four districts of Assam, India: Golaghat, Marigaon, Sibsagar and Jorhat. From each of the four districts, 10 villages were randomly selected for collection of information on ITK in insect's pest and disease management of horticultural crops. In each village, 10 farmers aged

above 40 years were selected. Thus, the total sample for the survey constituted 400 farmers. Data were collected with the help of pre-tested interview schedule.

In the present survey, information on various technologies which are being used even today by the farmers of Assam was collected (Table 1) with special reference to horticultural crops and it is expected that the efficacy of such methodologies could be enhanced with the aid of modern research and technologies. In certain methods, the amount of ingredients used to prepare the formulation varied from place to place. In such cases, the most common procedure was chosen. In many case, quantification of ingredients was done by approximation based on verbal description of preparation of local formulations.

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Table 1. Indigenous methods of insect pest and disease management in horticultural crops in Assam, India.

Practice	Use	Remarks
INSECT PESTS **Neem** Ground kernels of neem (*Azadirachta indica*) are soaked in water. The concentrated suspension is filtered and sprayed on plants.	Controls infestation of cabbage butterfly (*Pieris brassicae, Pieridae*) and diamond back moth (*Plutella xylostella,* Plutellidae) of cabbage (*Brassica oleracea* L. var. *captitata*) and checks infestation of an important polyphagus pest, i.e., gram pod borer (*Helicoverpa armigera, Noctuidae*).	Neem kernel extract contains antifeedant chemicals (Chopra, 1928). It Can effectively reduce the reproductive efficiency of gram pod borer (Sharma *et al.,* 1999.
Garlic, onion and chili One onion (*Allium cepa*) and one garlic *(Allium sativam) are ground separately and then mixed in a cup of water along with a pinch of chili (Capsicum annum) powder. To this, one cup of soap water is added and then the mixture is stored in*	Prevents infestation of various soft-bodied insect pests of summer and winter vegetables.	The pungent property of chilies, onion and garlic acts as good insect repellent.

a closed container for one week. The filtered suspension is diluted 2-3 times with water and sprayed on plants.		
Garlic, marigold and chili Two handfuls of marigold leaves (Tagetes spp.), five cloves of garlic and five red ripe chilies are chopped into small pieces and then the materials are boiled in a cup of water for five minutes. The filtered suspension is then diluted 4-5 times with water and sprayed on plants.	Suppresses the attack of various soft-bodied insect pests in summer and winter vegetables.	The typical smell of marigold leaves along with garlic acts as good insect repellent. Traditionally, the juice of marigold leaves is applied on fresh cut wounds as it has antiseptic properties.
Garlic Leaves and cloves of garlic are sun-dried and then ground. The powder is applied on seeds in storage.	Checks effectively various stored grain pests of pulses.	Sulfur compounds of garlic have insect repellent property.
Wood ash Fine wood ash is applied at the base and also on the leaves of crops like brinjal *(Solanum*	Controls infestation of soft bodied insects like citrus aphid (*Toxoptera aurantii,* Aphididae) and	Soil application of ash enhances host resistance against these pests (Gogoi and Majumdar,

melongena; egg plant) and Assam lemon Citrus limon).	brinjal fruit and shoot borer (*Leucinodes orbonalis,* Pyralidae).	2001). Application on ash on leaves and fruits makes them unfavorable for insect feeding.
Suspension of fine wood ash and water is sprayed on the leaves of tomato (Lycopersicon esculentum) and brinjal.	Controls fruit borers (L. orbonalis) of brinjal and tomato fruit worm *(H. armigera).*	Application of ash on leaves and fruits makes them unfavorable for insect feeding.
Equal quantities (100g) of the wood ash and ground lime are mixed in 10L of water. The suspension is sprayed on cucurbits.	Spraying effectively controls fruit fly *(Dacus cucurbitae,* Tephritidae) of cucurbits.	Lime and ash makes a fine film over the tender fruit which prevents oviposition.
Fine wood ash made from dry twigs, leaves, bark, etc. of neem is mixed with stored pulse grains	Protects stored grains of pulses from pulse beetles (*Callosobruchus maculates,* Bruchidae).	Neem ash inhibits oviposition and also checks adult emergence from eggs (Buraimoh *et al., 2000*).
Milk One or two cups of milk is poured at the base and also on the tender inflorescence coconut *(Cocos nucifera)* trees at weekly intervals.	Protects the palm from rhinoceros beetle (Oryctes rhinoceros, Scarabaeidae) and red palm weevil (*Rynchophorus ferrugineus,* Curculionidae).	Milk proteion (casein) attracts some predators and parasites of these pests (Gogoi and Majumdar, 2001).

Mustard Mustard oil cake is incorporated into the soil during first earthing up of potato (*Solanum tuberosum).*	Controls red and (Dorylus orientalis, Formicidae) in potato fields.	Mustard oil cake contains some toxic alkaloids, which have insect repellent properties.
Diseases **Cow's urine** Cow's urine is stored for two weeks, diluted with water (1:3) and sprayed on plants.	Prevents bacterial wilt (*Pseudomonas solanacearum*) of tomato, potato and chilies	
Asafetida and turmeric One g asafetida and 5g of turmeric powder is added to 10L of water. The suspension is used for soil drenching.	Prevents bacteria wilt of tomato and brinjal.	
Tobacco One kg of tobacco (*Nicotiana tabacum*) leaves is ground and mixed in 15 L of water. The suspension is kept for 2-3 days, filtered and then sprayed on plants.	Controls mosaic and bacterial wilt in tomato and brinjal.	

Indigenous Technical Knowledge in Agriculture and Intellectual property Rights

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The national policy on agriculture, formulated recently, seeks to visualize the vast untapped growth potential of Indian agriculture on one hand, while on the other to provide technically sound, economically viable, environmentally non-degrading and socially acceptable use of country's natural resources - land, water and genetic endowment to promote sustainable development of agriculture.

The concept of sustainable agriculture in Indian agricultural scenario has aroused interest in indigenous technical knowledge (ITK). These ITKs are based on experiences which gathered momentum through generations and are being developed and improved through informal experimentation. Thus, ITKs are based on the experiences, tested in most cases over centuries, and endowed with best adaptability to local environment. These are dynamic, holistic, eco-friendly and sustainable; and interwoven, and assimilated in the cultural life of the people.

In 1994, a patent for a fungicide derived from the Indian medicinal tree neem was granted jointly to the US Department of Agriculture and the US company W.R .Grace. The threat to our traditional knowledge is very real and growing by the day. For instances, 80% of the 5000 patents on plant – based formulations granted by the US in 2000 were of Indian origin. Realizing how adversely such biopiracy could hit us, India challenged the offending patents after locating appropriate references and arming themselves with sufficient evidence of traditional use. Following India's

challenge, the patents granted to neem and turmeric were revoked after the patent offices ascertained that there was no novelty involved and that the so called "innovation" had been used in India for centuries. Realizing that the solution did not lie in battling claims after patents have been granted, the Government of India decided to be proactive rather tans defensive.

Traditional Knowledge Digital library

When it comes to traditional knowledge, there is a wide gap in the availability of information pertaining to traditional in biodiversity – rich countries like India International patent offices insist on written published information oral, having being . But as far as traditional knowledge is concerned, much of it is oral, having being passed down from generation to generation. Besides, whatever printed literature is available lies scattered, is often codified or is available in regional languages. It is neither easily accessible nor easily understandable by patent examiners sitting in international patent office. So what was required was documenting our precious heritage in the area of traditional systems and creating more easily accessible non – patent literature databases that deal with traditional knowledge and that could easily be understood by patent examiners. TKDL was born as a collaborative project between National Institute of Science Communication and Information Resources (NISCAIR) and Ministry of Health and Family Welfare and Department of Industrial Policy & Promotion (DIPP). TKDL, in fact, is a database created on the codified traditional knowledge on Indian systems of medicine. According to Sri Shiv Basant, Joint Secretary, Dept of AYUSH, Ministry of Health & Family Welfare "It has been internationally recognized that TKDL is a maiden approach for defensive protection of traditional knowledge of the country. TKDL is being created with the objective of preventing misappropriation taking place in international patent offices."

Inventory of Indigenous Technical Knowledge in Agriculture

Geographical indications, the context of plant species used in indigenous knowledge-based technologies, indicate the origin of the species in a territory or region or locality, where the

characteristics of the plants are attributed to the origin. When associated with a product, geographical indications attribute a known quality of the product that in associated with a specific geographical location. One of the ways to protect the appropriate use of geographical indications, it is to be known commonly and documented and placed in the public domain. A large number of plant species are used in Indian agriculture for crop production, plant protection and post-harvest operations. In addition, production system in animal husbandry, fishery and household food and nutrition involves the use of various plant species. This has been made evident in the publications made under the National Agricultural Technology Project (NATP) on Collection, Documentation and Validation of Indigenous Technical Knowledge (ITK). The outcome of the project has been published in seven volumes as Inventory of Indigenous Technical Knowledge in Agriculture covering 4033 ITKs in agriculture. Validation of ITKs is an important aspect, which has remained almost untouched from research agenda. In this direction 111 ITKs have been taken up for validation, which include experimental validation of 14 thematic areas, viz., rain water management, soil and water conservation, tillage practices, crop and cropping systems, pest and disease management, farm implements, seed storage, horticulture, veterinary science and animal husbandry, fisheries, food product development, natural yarns and dyes, ethnic food and thermal efficiency and case studies in two thematic areas, viz, methods of weather forecasting and low-cost housing materials. The results obtained, in spite of availability of limited period, has been very interesting and extremely important for finding the scientific rationale of traditional wisdom and knowledge. Simultaneously, efforts need to be made to protect the issues relating to intellectual property rights so that the interest of the inventors and the actual users of the technologies are protected. Accordingly it

was thought appropriate to document the geographical indications of the plant species which are in use in indigenous knowledge-based practices that may help in development of appropriate technologies. Further, the knowledge of the plant species and its functioning capabilities in promoting productivity of agricultural and land-based activities will go a long way in rationalization of the practices, adoption and diffusion of the technologies. The outcome of the project also indicated the possibility of registration/patenting of some of the practices that may protect the intellectual property rights of the practices. A geographical indication is one of the laws in this direction.

A perusal of current literature on Indian plant species used in traditional agriculture reveals that different workers in different parts of India have interpreted in different ways. In many cases quite unrelated plants have been given the same name or the same plant has been given different names. The most important task ahead was to evolve ways and means to authenticate, codify and preserve information on all aspects of plant species and management practices in an unambiguous and scientifically valid way and link it with the modern scientific knowledge before this knowledge is irrevocably lost. Documentation on the geographical indications of the plant species in Inventory of Indigenous Technical Knowledge in Agriculture created by Mission Unit, Division of Agricultural Extension, Indian Council of Agricultural Research is mentioned below as an example which is in use in indigenous knowledge-based practices that may help in development of appropriate technologies.

Title of the ITK: Use of lemon juice to increase the productivity of citrus
Reference of the ITK*: 1468 Volume 2, page 270
Name of the plant used in ITK: Lemon

Contents

ITK—GEOGRAPHICAL INDICATIONS OF PLANT SPECIES

Names in Indian languages: Bengali: *baranebu, goranebu;* Gujarati: *motu limbu;* Hindi: *baranibu, jambira, paharikaghzi, paharinimbu;* Kannada: *bijapura, bijuri;* Marathi: *idalimbu, thoralimbu;* Tamil: *malai elumichai, periya elumichai;* Telugu: *bijapuram.*

English name: Lemon

Botanical name: *Citrus limon* (Linn.) Burm. F.

Active ingredients: Lemon is generally taken as fresh fruit. It is widely used in the preparation of lemonade, squash and home-made sherbet. Lemon juice may be used in preparing effervescent, diaphoretic and diuretic draughts. It is a well known French remedy for colds. The juice also possesses bactericidal property.

Geographical indications

Habit : A tree up to 6 m in height, of spreading habit, thought to be native to India but not found growing wild anywhere. Spines small, stout; leaves light-green, oblong to elliptic ovate, lanceolate, sharp-pointed sub-serrate, petioles narrowly winged; flowers purple in the bud, large; fruits ovoid or oblong, 7.5-12.5 cm long with a terminal nipple, very acrid; seeds few, small. The lemon presents a number of diverse forms. The common lemons in India are probably indigenous citron-lemon hybrids. *Patilebu* distributed throughout Assam is valued for its flavour and juice, which makes a refreshing sherbet.

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RICE PEST MANAGEMENT THROUGH ITK

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Although farmers are aware of various indigenous methods of pest control but they generally use so called modern synthetic chemicals because they are unable to fore see the deleterious effect on the non target organism. These insecticides are no doubt effective against insect pest but very toxic to mammals. Environmental concern coupled with growing resistance of insect pests, as a consequence of massive use of pesticides has given importance to eco-friendly traditional methods of pest control.

Rice is the staple food and major crop of Assam which covers about 70 per cent of the total area under crops of the state. In India more than 100 insect pests has been reported to causes damage to rice crop at one or other stages, starting from seedling to harvest and even in the store, and 20 of them are considered to be the major pest. Other than insect pest, the Rodents, the Birds and the Crabs also cause damages and reduce the yield of rice. The farmers of this region are traditionally rice grower and adopt their own traditional expertise to control these pests. A few of such "Indigenous Technical Knowledge" (ITK) on rice pest management followed by the farmers of different parts of the state were collected and laid down here for information of the scientific community in general and for the farmers in particular.

INSECT PEST:

Rice stem borers *(Chilo suppressalis,Tryporyza innotata, Sesamia incertulas S. inference),* Hispa *(Dicladispa armigera)*, Gundhi bug*(Leptocorisa oratorius)*, Case worm *(Nymphula depunctalis)*, Swarming caterpillar*(Spodoptera mauritia)*, Leaf folder*(Cnaphalocrocis medinalis)*, Gall midge*(Orseolia oryzae),* Brown plant hopper*(Nilaparvata lugens),* Rice green

leafhopper*(Nephotettix nigropictus, N. virescens)* are some of the important insect pest of rice. A few ITKs adopted by the farmers are given below:

Sl. No.	Itk	Insect Pest	Crop Stage	Possible Effecct
1.	Throwing peels of citrus fruit viz. *Robab tenga (Citrus grandis)*on standing water	Stem borer and other pests of rice	Mid tillering	Repel stem borers and other pests of rice
2.	Crashed rhizome of *Keturi haldhi (Cureuma zedoaria)* at different places of the field	Stem borer and Hispa	Tillering	It act as as pest repellent. It produces disagreeable odour which prevents pest attack
3.	Harvesting at the base of the crop	Stem borer	At harvest	It removes and destroy the pupae
4.	Plough down alleys after harvest of Autumn rice *(Sali rice)*	Many rice pest	After harvest	Hibernating insects are exposed to predators and kills due to hot sunshine
5.	Burning rice stubbles during November /December	Stem borers	After harvest	Larvae and pupae burnt down and their population in next crop season become less
6.	Dip ploughing during February/March	Hispa	After harvest	Reduce hispa population in next season
7.	Summer ploughing during March/ April	Stem borers	After harvest	Destruction of pests by exposing them to predators and bright sunshine.
8.	Pouring kerosene at the corners of the field	Stem borers	Tillering	The strong smell of kerosene oil compelled the adult borers to leave the field and hampered in egg laying
9.	Putting bamboo perch (*Jeng* / *Aagali bah*) or tree branches for birds sitting in the nursery as well as in main field.	Stem borer Leaf folder, Swarming caterpillar,	Nursery and tillering	It helps the predatory birds to sit and pick up insect pest.

	But those structures should be removed towards harvest to avoid bird pest that damages grains	and other pest.		
10.	Application of *Keturi haldhi (Cureuma zedoaria)* extract	Hispa and stem borer	Tillering	It act as repellent
11.	Throwing shopped leaves of *Keturi haldhi (Cureuma zedoaria)* and peels of peels of citrus fruit viz. *Robab tenga (Citrus grandis)* in thefield	Gundhi bug, Case worm etc.	Tillering to milky stage	It act as repellent
12.	Throwing cut pieces of stems of *Kola kachu (Colocasia esculenta)*	Caseworm	Tillering	It act as repellent
13.	Dusting with *posotia* leaves *(Vitex hegude)*	Hispa	Mid tillering	It act as repellent
14.	Pouring kerosene oil directly on standing water	Hispa	Tillering	It act as repellent
15.	Broadcasting goat's excreta in infested field	Hispa	Mid tillering	It act as repellent
16.	Moving a kerosene soaked rope over the crop and later draining out standing water	Case worm and Leaf roller	Early tillering	Due to the action of Kerosine the larvae are affected and fall down on water then it may be eaten by predators or drained out from the field
17.	Throwing leaves of *Germany bon (Eupatorium odoratum)*	Hispa and Case worm	Early tillering	It act as repellent
18.	Extracts of Germany bon*(Eupatorium odoratum)*, neem leaves *(Azadirechta indica or Malia azedarach)* and tobacco decoction, sprinkled sufficiently keeping standing water in the field	Stem borers	Tillering	Stem borer do not attack if, applied in time. The borers inside the stem get poisoned due to toxic effect.
19.	Throwing leaves of	Hispa and	Early	Repels the pest

	Bihlongoni (Arythyrium spp.)	Case worm	tillering	
20.	Throwing leaves of *Posotia (Vitex hegude)* on standing water	Hispa and Case worm	Early tillering	It act as repellent
21.	Sprinkling of Tobacco decoction	Hispa	Mid tillering	Alkaline mixture of tobacco act as deterrent
22.	Dead crabs, toad or frogs are hanged just above the rice canopy as bait with the help bamboo stick at different spots	Gundhi bug	Milking	The smells of decayed carcasses attract the bugs. The adult bug crowded over the bait, avoid egg laying and sucking the soft grains
23.	Beating the infested crop with thorny branches of Ber *(Zizyphus spp.)*	Hispa	Early tillering	The larva that live inside of leaf blade get injured due to the beating action of the thorny branch and while coming out of the leaf tissues it falls down and ultimately get killed
24.	Spraying with Neem leaves and seed extract	Leaf folder	Early tillering	It act as repellent and deterrent
25.	Bonfire at night in the field	Stem borer, Gundhi bug	Tillering and Milking	Attracting and burning the adult insect
26.	Using dead Lizards/Frog/ Crabs etc. inside an inverted bamboo pipe and placed in stagnant water so that the carcasses touches water level	Many rice pest	Tillering	Produce disagreeable smell in the standing water and repels pests
27.	Cutting tip portion of rice (2"-3") seedlings before transplanting and buried it to dip mud	Stem borers, Hispa, etc.	Uprooting	Cutting and destruction of tip portion also destroy eggs of the pests
28.	Cutting tip portion of rice up to 6" and buried in dip mud	Hispa	Tillering	It destroy the eggs and pupae present in the leaves

29.	By draining out standing water from the field for 2-3 days	Hispa and Caseworm	Tillering	Multiplication of the pests get reduced due to lack of water
30.	Provision of trench surrounding the rice field	Swarming caterpillar	Till harvest	The trench stops the migration of swarming larva to nearby field
31.	Cutting edges of alleys	All hibernating insects	Land preparation	Pest are exposed to direct sunlight and predators and there by population get reduced
32.	Provisions of shallow fish pond at the natural depression of the field for preservation of local fish	All insect pests	Tillering	The local fish predates on rice pest to a great extend
33.	Duck rearing in rice field	All insect pests	Tillering	Duck pick up many rice pests as their food

Crabs: The Land crabs and River crab *(*Sesarma *huzrdi)* damages young rice particularly in the low land situation by cutting the stems in main field at water level.

Sl. No.	Itk Practice	Crop Stage	Possible Effecct
1.	Use of raw cow dung @40kg/bigha on standing water in low land condition	Tillering	Raw cow dung repeal and disturb in movement and crab and go off from the field
2.	Small bamboo pole or branch is placed in each rice hill in low land situation	Early tillering	In clasping rice seedlings the crab get hard and thereby leave the field

Bird Pests: Only 25 out of 1200 species of birds found in India have been reported to inflict damage to crops. Out of these the common weaver bird *(Ploceus philippinus),* the Quelea *(Quelea quelea),* and *the* House sparrow *(Passer domesticus)* damages rice crop at maturity and storage condition.

Sl. No.	Itk Practice	Crop Stage	Possible Effecct
1.	Beating empty tin or drum in the field	Maturity	Production f sound birds are frightened and drive away from the field
2.	Carcass of a crow is tied to a long pole in centre of rice field	Maturity	The carcass of crow frighten birds and thus their attack on crop reduces
3.	Small polythene bags or sheets are tied to a long pole and placed in the centre of the field	Maturity	Due to wind, polythene sheets or bags flutter and produce sound which frighten the birds and thereby their attack reduces
4.	A piece of black or red cloth is tied to a long pole and placed in the centre of the field	Maturity	In presence of black or red cloth birds are scared and their attack reduces
5.	Using bell in the field which is operated from long distances with a long rope	Maturity	Due to sound production birds are frightened and fly away from field
6.	The field is encircled with reels of discarded cassettes by the help of bamboo posts	Maturity	The reels reflect light and produce sound which frighten away birds from the field
7.	Using bamboo pipes of 2” size, inside which a thin wire is placed horizontally with the help of two bamboo poles	Maturity	Birds when try to sit on the bamboo pipe but presence of wire make the bamboo pipe roll which frighten the birds and they fly away

RODENTS: Rats and Mice pests are responsible for causing enormous loss to crops in field as well as in the store. Of the 84

species of order Rodentia in India,about 10 rodent species are of major importance. In India they inflict, on an average, 4.6-5.0 per cent loss in rice production. About 2.5 per cent losses are caused due to rodents in storage annually. The commonest species found in rice field is Field Rat (*Bandicota bengalensis and B. indica)*. The rat uproots paddy seedlings at nursery bed to eat the seeds and later on they also cut down the plants and damage continues till harvest. House Rats *(Rattus rattus)*, House Mouse *(Mus musculas)* and Field mouse *(Mus booduga)*.

Sl. No.	Itk Practice	Crop Stage	Possible Effecct
1.	Fumigating the rodent burrows with smoke of burnt paddy husk	After harvest	The rodents are suffocated to death due to fumigation
2.	Filling up rodent burrows with water	After harvest	After complete filling up of the burrows with water the rodents come out and they are killed by the farmers easily
3.	Digging of the rodent burrows	After harvest	Rodent attack in next crop season is reduced

STORED GRAIN PEST: Insect pests of stored grains may destroy 10-15 per cent of the grains and contaminate the rest with undesirable odours and flavours. Stored grain insect pests need more than 10 per cent moisture and optimum is around 14 per cent. Therefore, grain having less than 10 per cent moisture is considered safe for storage. About a dozen species of insect pests are reported to damage considerably during storage. Rice weevil *(Sitophilus oryzae)* and *(Sitophilus granarious)*, Rice moth *(Corcyra cephalonica)*, Angoumois grain moth *(Sitotroga cerealella),* Rust red flour beetle *(Tribolium castaneum),* Rice moth *(Corcyra cephalonica),* Indian meal moth *(Plodia interpunctella),* Almond moth *(Ephestia cautella)*, Khapra beetle *(Trogoderma granarium).* Therefore, prior to store the grains should be dried until the moisture content become

less than 9 per cent and needs further drying if the moisture percentage increases in storage condition.

Sl. No.	Itk Practice	Pests	Possible Effecct
1.	Mixing curry leaves (*Murraya koenigi*) and neem leaves with grains	Weevil and Grain moth	Act as repellant
2.	Covering grains with a layer of dried paddy husk of 2"-3"	Weevil and grain moth	The pests prefer to feed on upper 2-3 inch layer of grains and due to presence of husk layer the grains remain safe
3.	Storing grains in bamboo made *Ber* plastered with cow-dung and mud. The top of the *Ber* is then covered or plastered with 1"-2"cow and mud mixture	All stored grain pest of rice	The structure protect the pests to reach grain from outside
4.	Storing grains in bamboo and straw bins *(tom)* along with neem leaves *(Azadirachta indica or Malia azedarach)*	All store grain pest of rice	The structure protects the pests to reach grain from outside also do not allow moisture to increase in grains

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Indigenous Technical Knowledge in Organic Agriculture

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Indigenous technical knowledge (ITK) is the knowledge that people in a given society has developed over time, and continues to develop. It is based on experience, often tested over long period of use, adopted to local culture and environment, dynamic and changing, and lays emphasis on minimizing the risks rather than maximizing profits. Indigenous Knowledge (IK) refers to the existing unique, traditional, local knowledge and is developed around the specific conditions of women and men indigenous to particular geographic area. IK is the local knowledge--- knowledge that is unique to a given culture or society. The term ITK is often camouflaged with the belief that is associated with forthcoming happenings and the innovations made by the farmers to solve specific problems. The ITK covers a wide spectrum---soil, water and nutrient management; pasture and fodder management; crop cultivation; plant protection; farm equipment, farm power, post harvest preservation and management; agro-forestry; bio-diversity conservation and also exploitation; animal rearing and health care; animal products preservation and management; fisheries and fish preservation; and ethnic foods and homestead management.

Organic agriculture is one among the broad spectrum of methodologies that support environment. It aims to minimize the use of external inputs, avoiding the use of synthetic fertilizers and pesticides. ITK-based practices offer its potential to accomplish organic agriculture where biological methods are adopted for farming, keeping away the off-farm inputs.

Sources of ITK

The following sources of ITK may be explored:

- Farmers and community members especially elders are the best sources of ITK. But, since ITK is unevenly distributed in communities, it is important to find out who knows what to tap the right sources; otherwise, data will not truly reflect the ITK in the community. For example, asking men about garden plants when women are in charge of home gardens might lead to a conclusion that villagers know little about gardening.
- Folk-lore, songs, poetry and theatre can reveal a great deal about people's values, history and practices. These are often recited from generations and not written down, hence need to be recorded.
- Although ITK is mostly transmitted by word of mouth, yet some indigenous forms of community keeping do exist. These include writings, paintings and carvings, and many other forms.
- People working with communities such as extensionists can be a valuable source of ITK. Other resource persons are local school headmaster, credit co-operative society officials, village co-operative members, men and women labours, and village Panchayat President.
- Secondary sources include published and unpublished documents, databases, videos, photographs, museums and exhibits.

Practices based on indigenous knowledge

ITK based practices have been documented under the auspices of Mission Mode National Agricultural Technology Project on Collection, Documentation and Validation of ITK. The digest of some of the ITK's is furnished below:

- ***Theme or Topic*:** Mixed cropping for controlling wilt in chillies

  PRACTICE: In this practice farmers are practising mixed cropping of chilli, coriander and garlic for controlling wilt in chilli. Coriander is also grown on field bunds for seed

purpose. The smell of coriander and garlic works as repellent for the insects. Farmers also get additional income from coriander leaf from time to time.

- ***Theme or Topic*:** Reducing inbreeding by selection of seeds from different villages

  PRACTICE: Seeds for future cultivation are collected from selected plots manifesting vigour, early maturity, disease resistance and higher productivity. After 3-4 years the seed source is shifted to other villages without diluting the selection criteria. This avoids inbreeding.
- ***Theme or Topic*:** Increasing cropping intensity through relay planting of cucurbits with wheat

  PRACTICE: Cucurbits, viz. cucumber, bottle gourd and bitter gourd, are planted as relay crops after cutting 75 cm wide strips of standing wheat crop at an interval of 2-3 m in March. It is done to harvest early crop of cucurbits. The green wheat crop cut is used as fodder. The main focus of the system is that sowing of cucurbits is advanced considerably, and early marketing helps in fetching higher return from the harvest.
- ***Theme or Topic*:** Sprinkling honey for better pollination in ridge gourd

  PRACTICE: Ridge gourd is a cross-pollinated crop. Its fruit setting is directly affected by bees and other pollinating insects. Approximately 100 ml honey is mixed with 10 litres of water and sprinkled over the crop in the evening. This increases pollination of flowers because of increased visits by bees and other insets, which are attracted by the smell of honey.
- ***Theme or Topic*:** Control of Pea Pod-borer by neem-seed extract

  PRACTICE: Dried 5 kg neem (*Azadirachta indica*) seeds are powdered, mixed in 10 litre of water and kept overnight. The extract is filtered and 90 litre of water is added to get 5% neem-seed extract. About 200 gm washing powder is added with the extract for sticking, and the extract is spread on the leaves.

- ***Theme or Topic*:** Use of extract of neem leaves and *Parthenium* to check infestation of *Helicoverpa sp.*
  PRACTICE: In Dhule district in Maharastra, farmers use extract of neem leaves and *Parthenium sp*. to control *Helicoverpa sp. Parthenium* and neem leaves are taken in equal quantity, crushed and dipped in water for 24 hr. The extracted solution @ 20 ml is sprayed in dilution with water in 10 litre of water.
- ***Theme or Topic*:** Goat milk to cure leaf curl in vegetable and spice crops
  PRACTICE: Chilli (*Capsicum annuum*), brinjal (*Solanum melongena*) and leaf curling. This disease occurs due to extreme cold, particularly in November and December. Sprinkling of fresh goat milk on the plant using pump sprayer, controls this phenomenon. The results are visible in 1 week.
- ***Theme or Topic*:** Control of flower dropping of vegetable crops
  PRACTICE: Neem seed 2 kg are ground well and diluted with water and filtered. To this filtrate 10 kg fresh cow dung is mixed thoroughly. This is sufficient for spraying on 1 acre (0.4 ha) of land by adding required quantity of water to stop flower dropping.
- ***Theme or Topic*:** Control of leaf-eating insects of cabbage and cauliflower through neem leaves
  PRACTICE: Leaf-eating insects of cabbage and cauliflower are controlled by using extract of neem (*Azadirachta indica*) leaf when leaf-eating insects appear.
- ***Theme or Topic*:** Use of *Kochila* (*Strychnos nux-vomica*) and cow dung compost in brinjal for controlling fruit and shoot-borer
  PRACTICE: Cow dung, 10 kg *Kochila* seed powder and 25 kg *Kochila* leaf are put in a compost pit of 10'x3'x3' by mixing thoroughly. Then 10 litre cow urine is added to the pit for 10 consecutive days and covered with soil. After two months the compost become ready. This compost (5 g) is added to each plant once at the time of sowing and at 45 days

after planting. Due to its repellent action, incidence of shoot and fruit borer is reduced.

- ***Theme or Topic*:** Increasing germination of Solanaceous tropical vegetables by hardening with buttermilk
  PRACTICE: A mixture of 10 ml of 3-day-old buttermilk is mixed with 40 ml water and kept aside for 3 days. The mixture is ready for use. Seeds of solanaceous vegetables are soaked in this mixture for 6 hr and the treated seeds are dried under shade to remove excess moisture. The germination of tropical vegetables such as tomato, brinjal and chilli is increased by the application of this practice up to 80%.
- ***Theme or Topic*:** Sprouting of Yam by cowdung slurry
  PRACTICE: Tuberous roots of Yam are divided into many pieces, weighing 150 to 200 g, dipped in freshly prepared cowdung slurry, dried in shade and kept in sand for sprouting. This results in sprouting within 5-6 days, giving 100% germination. Application of cowdung slurry prevents the entry of micro-organisms and loss of moisture from the cut ends and supply the nitrogen required during initial stages. An additional income over planting only tops of the tuber could be obtained.
- ***Theme or Topic*:** Seed extraction of tomato by using rice bran
  PRACTICE: Ripened tomatoes of elite varieties are squeezed by hand on well-spread rice bran@ 1 kg rice bran for 1 kg of seed extraction. After thorough mixing and drying for 24-48 hr, the bran is separated from the mixture by hand winnower. Healthy and clean tomato seeds are preserved.
- ***Theme or Topic*:** Control of fruit and shoot borer in brinjal by using *ranbeli* tree bark
  PRACTICE: Finely ground bark of *ranbeli* (*Feronia* sp.) tree (12-13 kg) is soaked in 50 litre of water for 8 to 10 hr, and this solution is dissolved in 500 litre water to cover 1 ha of brinjal crop. This increases the yield by 20% over untreated plot. Ranbeli bark extract is 80% effective as compared with the recommended practices, because the

chemicals present in its bark reduces the fruit and shoot borer incidence.

Diversity of Indigenous Knowledge

Indigenous knowledge systems are:

- Adaptive skills of local people usually derived from many years of experience, which have often been communicated through oral traditions and learned through family members over generations.
- Time-tested agricultural and natural resource management practices, which pave the way for sustainable organic agriculture.
- Strategies and techniques developed by local people to cope with the changes in the socio-cultural and environmental conditions.
- Practices that are accumulated by farmers due to constant experimentation and innovation.
- Trial-and-error problem-solving approaches by groups of people with an objective to meet the challenges they face in their local environments.
- Decision-making skills of local people that draw upon the resources they have at hand.

Characteristics of ITK

- ITK is not static but dynamic.
- Exogenous knowledge and endogenous creativity brings changes to ITK.
- ITK is intuitive in its mode of thinking.
- ITK is mainly qualitative in nature.
- ITK study needs a holistic approach
- ITK, if properly tapped, can provide valuable insights into resources, processes, possibilities and problems in particular area.
- ITK is recorded and transferred through oral tradition.
- ITK is learned through observation and hands-on experience.

- ITK forms an information base for variety.
- ITK reflects local tradition.

Roles of ITK

- ITK can aid development efforts
- ITK can facilitate local people's participation
- ITK is a valuable source of developing appropriate technologies

Scope of ITK

- New biological and ecological insight
- Resource management
- Protected areas and conservation education
- Development planning
- Environment assessment

Organic agriculture is holistic production management system which promotes and enhances agro-ecosystem health, including bio-diversity, biological circles, and soil biological activities (FAO, 2002). Organic production systems are governed by a set of standards to be followed strictly by the producers of organic food. ITK-based practices offer its potential to accomplish organic agriculture where biological methods are adopted for farming, keeping away the off-farm inputs. ITK-based practices will also help to furthering the concept of biodynamics and natural farming where the soil-health-building process is left to the nature, as the inputs for ITK are drawn from the products of soil and are returned to the soil in the form of compost or manure or soil and plant health-protecting agents. The practices based on indigenous knowledge on agriculture and allied aspects are innumerable and variable in different parts of the country. The integration of ITK and scientific knowledge will help to develop technologies that would be more need-based, better problem-solving, locally applicable, easily acceptable, eco-friendly, and more intelligible and credible, and more convincing to the farmers.

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ডাকৰ বচন

‘ধনৰ মাজত ধানৰ শোভন।
ধান নহ’লে তেখেনে মৰণ।।
এতেকে কৃষিক কৰিবা সাৰ।
কৃষিতে দুর্ভিক্ষ হ’ব নিস্তাৰ।।
ধান হলে হোৱে সবে মঙ্গল।
তাহাৰ অভাৱ সবে বিফল।।’

ডেৰিয়া ভূমিক লোৱে সুবুধি।
ঘন আলি দিবা সবাক সুধি।।

ঘন ঘনকৈ দিবা আলি।।
আহিন কাতিত ৰাখিবা পানী।।
যেনেকৈ ৰাখে ৰজাৰ ৰাণী।

আহু ৰুবা খোজত বুৰি।
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হাতেকতে গোছা দিবা জানি।
যেবে দেখা নহয় শালি।
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